

CBSE Board
Practice Paper 2018

NEET
FOUNDATION

PMT
Practice Paper

MT
BIOLOGY
today

India's #1
MONTHLY FOR **NEET**

NEET
Essential

Animal
Tissues-I

Monthly
Practice
Problems
(XI & XII)

BIO-GRAM

High
Yield Facts

Morphology of

Flowering Plants-II

Organisms and Populations

CONCEPT MAP

Vegetative
Propagation in Plants

Trust of more than
1 Crore Readers
Since 1982



2018100009774

MT BIOLOGY today

Vol. XX No. 2 February 2018

Corporate Office:

Plot 99, Sector 44 Institutional Area,
Gurgaon - 122 003 (HR), Tel : 0124-6601200
e-mail : info@mtg.in website : www.mtg.in

Regd. Office:

406, Taj Apartment, Near Safdarjung Hospital,
Ring Road, New Delhi - 110029.

Managing Editor : Mahabir Singh
Editor : Anil Ahlawat

CONTENTS

10 High Yield Facts-Botany

Morphology of Flowering Plants - II

29 NEET Essential

Animal Tissues - I

45 MPP-10

53 PMT Practice Paper

42 Concept Map

57 High Yield Facts-Zoology

Organisms and Populations

72 NEET Foundation

79 CBSE Board Practice Paper 2018

83 MPP-10

87 Biogram

www.mtg.in | February 2018 | Pages 96 | ₹ 30

CBSE Board 79
Practice Paper 2018

NEET 72
FOUNDATION

PMT 53
Practice Paper

MT **BIOLOGY** today

India's #1 NEET MONTHLY FOR

NEET 29
Essential
Animal Tissues-I

Monthly Practice Problems 45 (XI & XII) 83

BIO-GRAM 87

High Yield Facts 10
Morphology of Flowering Plants-II
Organisms and Populations 57

CONCEPT MAP 42
Vegetative Propagation in Plants

Subscribe online at www.mtg.in

Individual Subscription Rates

	1 yr.	2 yrs.	3 yrs.
Mathematics Today	330	600	775
Chemistry Today	330	600	775
Physics For You	330	600	775
Biology Today	330	600	775

Combined Subscription Rates

	1 yr.	2 yrs.	3 yrs.
PCM	900	1500	1900
PCB	900	1500	1900
PCMB	1000	1800	2300

Send D.D/M.O in favour of MTG Learning Media (P) Ltd.
Payments should be made directly to : MTG Learning Media (P) Ltd,
Plot 99, Sector 44 Institutional Area, Gurgaon - 122 003, Haryana.
We have not appointed any subscription agent.

Printed and Published by Mahabir Singh on behalf of MTG Learning Media Pvt. Ltd. Printed at HT Media Ltd., B-2, Sector-63, Noida, UP-201307 and published at 406, Taj Apartment, Ring Road, Near Safdarjung Hospital, New Delhi - 110029.

Editor : Anil Ahlawat

Readers are advised to make appropriate thorough enquiries before acting upon any advertisements published in this magazine. Focus/Infocus features are marketing incentives. MTG does not vouch or subscribe to the claims and representations made by advertisers. All disputes are subject to Delhi jurisdiction only.

Copyright© MTG Learning Media (P) Ltd.

All rights reserved. Reproduction in any form is prohibited.

HIGH YIELD FACTS



Class XI

MORPHOLOGY OF FLOWERING PLANTS - II

FLOWER

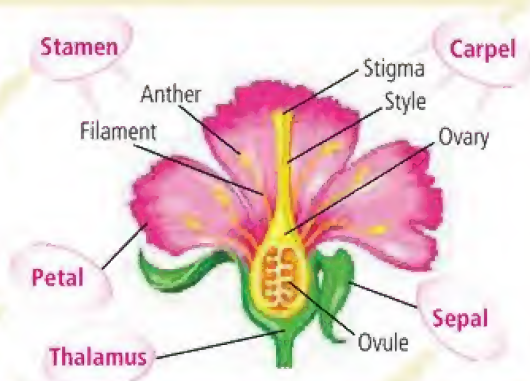
- Flower is a **specialised condensed shoot** meant for carrying out the sexual reproduction in plants. It bears floral leaves and gives rise to seeds and fruits. The study of flowers is called **anthology**.

Carpel or female reproductive part forms the innermost whorl of a flower. The free occurring unit of gynoecium is called pistil, which consists of basal swollen **ovary**, a stalk like **style** and a terminal receptive part called **stigma**. Inside the ovary **ovules** are present.

Stamen is the male reproductive part of a flower. It is made up of two parts, a stalk like **filament** and a knob like terminal **anther**. Each anther has two lobes which are attached at the back by a sterile band called **connective**.

Petals constitute the upper accessory whorl of floral organs called **corolla** which is brightly coloured to attract insects for pollination. In a petal, the lower part is usually narrow and is termed as **claw** whereas the expanded portion of the petal is called **limb**.

Thalamus is a **modified branch**, that represents the axis of the floral whorls with undeveloped or suppressed internodes between them.



Sepals constitute the lower accessory whorl called of mostly green, flattened or foliaceous floral organs. It is mainly meant for **protecting** other floral parts in the bud condition.

A flower can be

- Bisexual** : Both the essential organs are present.
- Neuter** : Both the essential organs are absent.
- Unisexual** : Only one of the two essential organs is present.
- Unisexual flower** would be **pistillate** (only female parts are present) or **staminate** (only male parts are present).

Analysis of various PMTs from 2013-2017

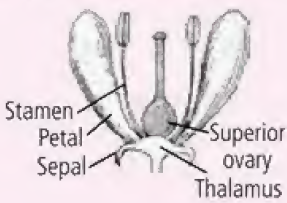
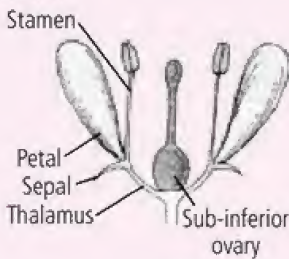
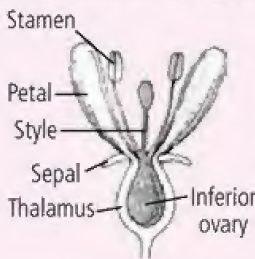
	2013	2014	2015	2016	2017
AIPMT/NEET	3	5	5	9	3
AIIMS	1	1	1	3	1
AMU	7	5	4	-	-
Kerala	-	5	6	4	-
K-CET	3	2	3	-	-
J & K	-	3	2	-	-

- A plant can be (i) **monoecious** - if male and female flowers develop on the same plant, *e.g.*, maize, castor or (ii) **dioecious** - if male and female flowers borne on separate plants, *e.g.*, mulberry, date palm. When more than two types of flowers bisexual, male and female develop on the same plant it is called polygamous *e.g.*, *Acer rubrum*,
- When male and bisexual flowers are present on the same plant, it is called **andromonoecious**, *e.g.*, *Veratrum*.
- When female and bisexual flowers are present on the same plant, it is called **gynomonoecious**, *e.g.*, plants with heterogamous head inflorescence in Family Asteraceae.
- Calyx and corolla together constitute accessory floral whorls. Depending upon the presence or absence of these whorls flower can be:
 - Achlamydeous** : Accessory floral whorls are absent, *e.g.*, *Piper*.
 - Monochlamydeous** : Only one accessory whorl (either calyx or corolla) or perianth (a collective term given to a group of undifferentiated calyx and corolla), is present, *e.g.*, *Polygonum* (Polygonaceae), onion (Liliaceae).
 - Dichlamydeous** : Both the accessory whorls are present, *e.g.*, *Hibiscus rosa-sinensis*.
- In some plants, thalamus shows distinct nodes and internodes. The internode between calyx and corolla is termed as **anthophore**, *e.g.*, *Silene*; that between corolla and androecium, the **androphore**, *e.g.*, *Passiflora*; and that between androecium and gynoecium, the **gynophore** or **gynandrophore**, *e.g.*, *Cleome*.
- Sometimes thalamus is prolonged into gynoecium to form a central axis and is called **carpophore**, *e.g.*, coriander.
- A floral bud like a vegetative bud is either terminal or axillary in position.
- Arrangement of sepals, petals, stamens and pistil, etc., on the thalamus is the same as that of the leaves on the stem or the branch, *i.e.*, alternate, opposite or whorled.

Relative Position of Floral Organs on Thalamus

- There are three forms of thalamus as regards the insertion of pistil and androperianth (other floral organs) *viz.*, **hypogyny**, **epigyny** and **perigyny**.

Table: Differences between hypogynous, perigynous and epigynous flowers

	Hypogynous flower	Perigynous flower	Epigynous flower
(i)	The upper part of thalamus is slightly swollen and forms a cushion like disc.	The upper part of thalamus may be disc shaped, cup-shaped or flask-shaped.	The upper part of thalamus is usually flask-shaped or tubular.
(ii)	Calyx, corolla and androecium arise below the level of ovary.	Calyx, corolla and androecium arise from around the ovary and not beneath it.	Calyx, corolla and androecium arise from above the level of ovary.
(iii)	Ovary is superior while all other floral parts are inferior.	Ovary is half-superior/half-inferior.	Ovary is inferior while all other floral parts are superior.
(iv)	The gynoecium is placed at the top of the thalamus. The wall of ovary is not fused with the thalamus.	The ovary is placed at the bottom of cup or flask-shaped thalamus. Ovary wall is not fused with the thalamus.	The ovary is completely inserted and the wall of ovary is fused with the thalamus.
(v)	Calyx, corolla and androecium remain separated from the gynoecium so that the ovary is visible from outside. 	Calyx, corolla and androecium often develop from a common base. The ovary of gynoecium may or may not be visible from outside. 	Calyx, corolla and androecium develop jointly from the neck of hollowed out thalamus so that the ovary is not visible from outside. 

Floral Symmetry

- The arrangement of floral organs around the axis of a flower is known as **floral symmetry**. The shoot on which the flower is borne is called **mother axis**. The side of the mother axis is posterior while the side of the bract is anterior. In terminal flowers, a distinction into anterior and posterior sides is absent. Various types of flower are summarised as follows.

On the basis of floral symmetry

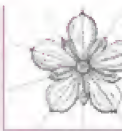
Zygomorphic flower

It can be divided into two equal halves by only one vertical plane, e.g., pea, *Ocimum*.



Actinomorphic flower

It can be divided by any vertical plane into two equal and similar halves, e.g., mustard, *Catharanthus roseus*.



Asymmetrical flower

It cannot be divided into two equal halves by any vertical plane, e.g., *Canna*.

Heteromerous

Number in all the whorls is neither the same nor any multiple.

On the basis of number of floral parts

Isomerous

Whorls have equal number of parts or number in one whorl is multiple of the number of other whorl.

It can be **bimerous** (floral parts in 2 or multiple of 2), **trimerous** (floral parts in 3 or multiple of 3), **tetramerous** (floral parts in 4 or multiple of 4) or **pentamerous** (floral parts in 5 or multiple of 5).

Floral Phyllotaxy

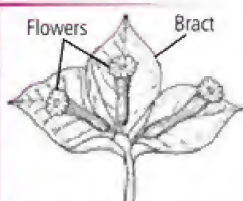
- Floral organs are borne on the thalamus either in spirals (**acyclic** or **spiral**, e.g., *Magnolia*, *Nymphaea*), whorls (**cyclic**, e.g., *Petunia*) or with some organs in spirals and other organs in whorls (**spirocyclic** or **hemicyclic**, e.g., *Ranunculus*).

BRACT

- Bract is a small leaf like structure present on the peduncle which bears a flower in its axil. The floral buds are usually protected by the bracts. Flower with a bract is described as **bracteate** and the flower without a bract is known as **ebracteate**.

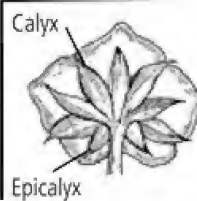
Petaloid

Petals-like large, coloured bracts, e.g., *Bougainvillea*, *Euphorbia*.



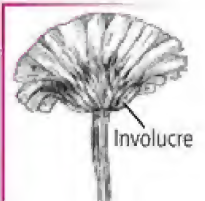
Epicalyx

One or more whorls of bracteoles are found at the base of calyx, e.g., China rose, strawberry.



Involucre

A large number of bracts form compact one or more whorls around a flower or an inflorescence, e.g., Sunflower.



Types of bract

Foliaceous

Leaf like, expanded green bract, e.g., *Adhatoda*, *Grossandra*.

Scaly

A membranous small bract present at the base of involucre bract, e.g., Sunflower.



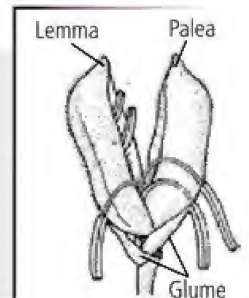
Spathe

A large modified bract which encloses spadix inflorescence totally or partially, e.g., *Alocasia*, *Musa*, etc.



Glumes

The bracts found on the rachilla of spikelets. They may be sterile glumes or fertile glumes, e.g., *Oryza sativa*.



CALYX

- Calyx is the outermost whorl made up of sepals. It may be **polysepalous** (with free sepals) or **gamosepalous** (with fused sepals).

On the basis of duration

Caducous

Sepals fall off just after opening the bud, e.g., *Argemone*, *Papaver*, etc.

Deciduous

Sepals fall off along with petals just after fertilisation, e.g., mustard.

Persistent

Sepals remain attached with the ripe fruit, e.g., *Pisum*, *Ocimum*, Family Solanaceae.



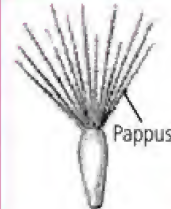
Hooded
In *Aconitum*, one of the sepals is modified into a hood which covers the whole flower.



Spurred
In *Larkspur*, from the base of one of the sepals arises a tubular outgrowth called spur.

Modification of sepals

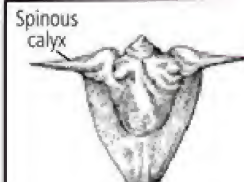
Pappus
Sepals modified into hairy structure which helps in dispersal of fruits, e.g., *Sunflower*.



Leafy and petaloid
In *Mussaenda*, one of the sepals is modified into a large leaf-like coloured structure.



Spinous
In *Trapa*, the calyx is persistent and modified into two spines.



COROLLA

- Corolla is the second whorl of a flower made up of petals. It may be **polypetalous** (petals free) or **gamopetalous** (petals fused).



Cruciform
Four free clawed petals are arranged diagonally or in the form of a cross, e.g., mustard, candytuft, etc.



Caryophyllaceous
Corolla consists of five petals with distinct limbs and claws. The claw and the limb of each petal remain more or less at right angle to each other, e.g., *Dianthus*.



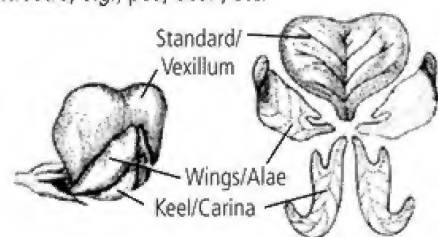
Rosaceous
Five or more sessile or shortly clawed petals are bent horizontally like a saucer, e.g., *Rosa indica* (rose).

Types of polypetalous corolla

Campanulate
Corolla is bell-shaped, e.g., *Physalis*



Papilionaceous
Five unequal or irregular petals are arranged like a butterfly. The posterior large bilobed petal called **standard** or **vexillum**, overlaps the two smaller lateral petals named **wings** or **alae**. The latter overlap the two anterior petals, which are fused laterally by the upper anterior margins to form a boat shaped structure called **keel** or **carina**. It is the characteristic of **sub-family Papilionaceae**, e.g., pea, bean, etc.



MPP-10 CLASS XII

ANSWER KEY

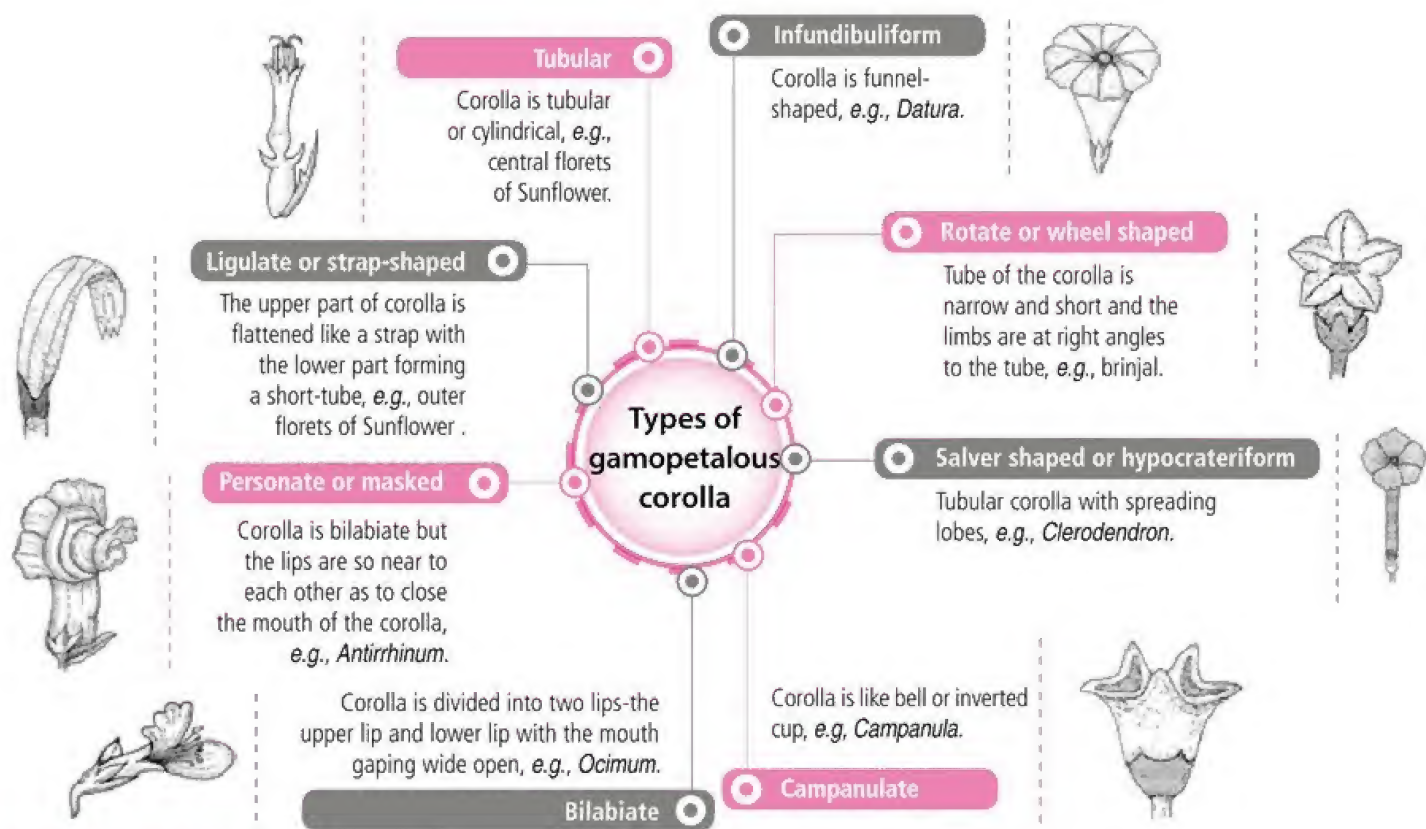
1. (d)	2. (b)	3. (c)	4. (b)	5. (d)
6. (d)	7. (a)	8. (c)	9. (c)	10. (d)
11. (d)	12. (b)	13. (b)	14. (b)	15. (b)
16. (c)	17. (c)	18. (a)	19. (b)	20. (d)
21. (d)	22. (b)	23. (b)	24. (d)	25. (d)
26. (b)	27. (c)	28. (d)	29. (c)	30. (c)
31. (c)	32. (d)	33. (a)	34. (d)	35. (d)
36. (c)	37. (b)	38. (d)	39. (c)	40. (a)



WHO AM I ...

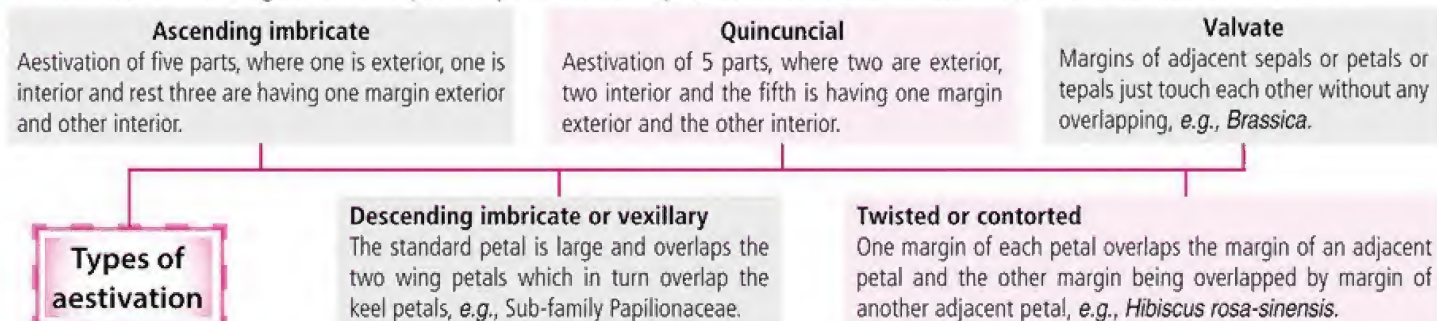
"I am a type of fruit found in cherry, where both epicarp and mesocarp are edible."

...search me 😊



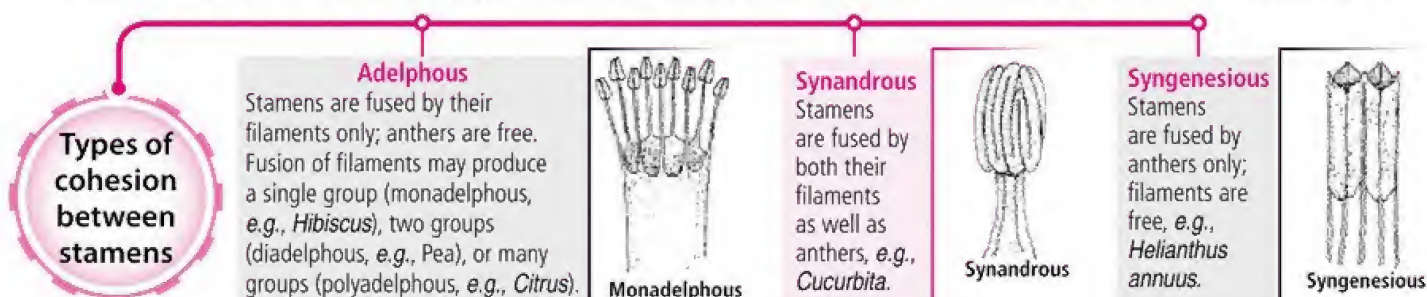
AESTIVATION

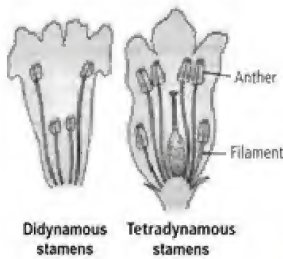
- The mode of arrangement of sepals or petals with respect to one another in the floral bud is termed as aestivation.



ANDROECIUM

- Androecium is the third whorl made up of stamens or microsporophylls. Each stamen consists of filament, anther and connective.
- Stamens may be borne directly on the thalamus or fused with petals (= **epipetalous**, e.g., *Solanum*, *Petunia*) or tepals (= **epiphyllous** or **epitepalous**, e.g., *Asphodelus*).
- In majority of angiosperms, anthers are two lobed or **ditheous**. Each anther lobe consists of two pollen sacs (or microsporangia). Thus a typical ditheous anther is always **tetralocular** (or tetrasporangiate).
- In members of Family Malvaceae, anthers are **monotheous**. Pollen grains (or microspores) are produced in the microsporangium. Fusion of stamens with a dissimilar organ is called **adhesion** while fusion with a similar organ is known as **cohesion**.





The free stamens are called **polyandrous**. They may be equal or unequal in length. The two common types of unequal stamens are **tetradynamous** (four long and two short, e.g., *Brassica*) and **didynamous** (two long and two short, e.g., *Ocimum*).

Depending upon the position of stamens

Diplostemonous

Stamens of outer whorl alternate with petals (alternipetalous) and stamens of inner whorl lie opposite to the petals (antipetalous), e.g. *Murraya exotica*, *Cassia*.



Diplostemonous stamens

Obdiplostemonous

Here, stamens of outer whorl lie opposite to the petals (antipetalous) whereas those of inner whorl alternate with petals (alternipetalous), e.g. *Dianthus*, *Stellaria*.



Obdiplostemonous stamens

Fixation of anthers

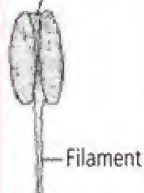
- The mode of attachment of the anther to the filament varies greatly in flowers.

Types of fixation of anthers

Adnate

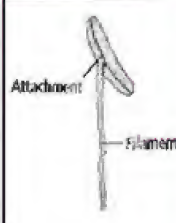
The filament is fixed to the anther in such a manner that it runs up the entire length of the anther at its backside, e.g., *Magnolia*, *Ranunculus*, *Nymphaea*.

Connective



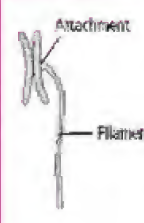
Dorsifixed

The filament is fixed to the dorsal side or back of the anther and anther is immovable, e.g., *Hibiscus rosa sinensis*, *Passiflora*, *Sesbania*, etc.



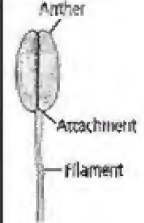
Versatile

The filament is attached to the middle of the connective so that anther lobes can swing on it freely, e.g., grasses.



Basifixed

The filament is attached to the base of the anther, as in mustard, *Datura*, radish.



Types of connective

- Connective can be of following types:

- Discrete** : The connective is very narrow, so that the two anther lobes lie in close proximity as in *Adhatoda*, *Euphorbia* sp.
- Divaricate** : The connective is broad and the two anther lobes are separated as in *Tilia* sp.
- Distractile** : In *Salvia*, the connective is highly elongated. Its one end bears a fertile anther lobe while the other end has a sterile anther lobe.
- Appendiculate** : The connective becomes feathery and grows beyond the anther.

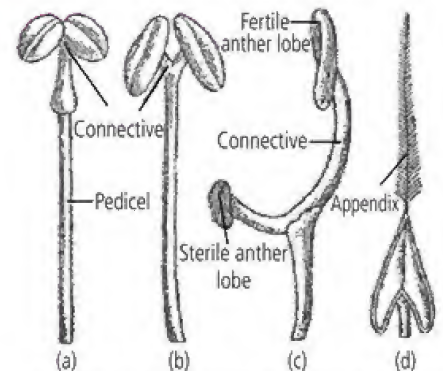
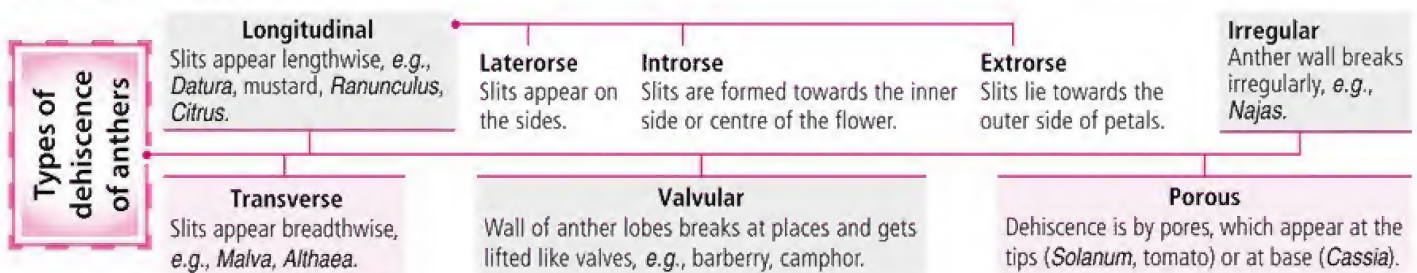


Fig.: Types of connective : (a) Discrete (b) Divaricate (c) Distractile (d) Appendiculate

Dehiscence of Anthers



GYNOECIUM

- It is the fourth whorl made up of one or more carpels (megasporeophylls). Depending on the number of carpels, gynoecium may be monocarpellary, bicarpellary, tricarpellary, tetracarpellary, pentacarpellary and multicarpellary having one, two, three, four, five and many carpels, respectively.

Cohesion of carpels

Apocarpous

Gynoecium comprises of free carpels, e.g., *Ranunculus*.

Syncarpous

Gynoecium comprises of two or more carpels which are fused, e.g., *Hibiscus*.

- **Ovary** has one or more chambers or **loculi** (singular locus) : unilocular (*e.g.*, pea); bilocular (*e.g.*, mustard); trilocular (*e.g.*, *Asparagus*); tetralocular (*e.g.*, *Ocimum*); pentalocular (*e.g.*, China rose); multilocular (*e.g.*, *Althaea*, lady's finger).
- In the chambers there are present oval outgrowths called **ovules**. Ovules later mature into seeds while the wall of the ovary forms a covering called **pericarp**. The two together constitute a fruit. A sterile and undeveloped pistil is called **pistillode**.

Types of style	Terminal	Lateral	Gynobasic
	Style lying in the same straight line with the ovary, <i>e.g.</i> , <i>Hibiscus</i> .	Style arising from the side of the ovary, <i>e.g.</i> , <i>Potentilla</i> .	Style arising from the depression in the centre of the ovary or directly from thalamus, <i>e.g.</i> , <i>Ocimum</i> .

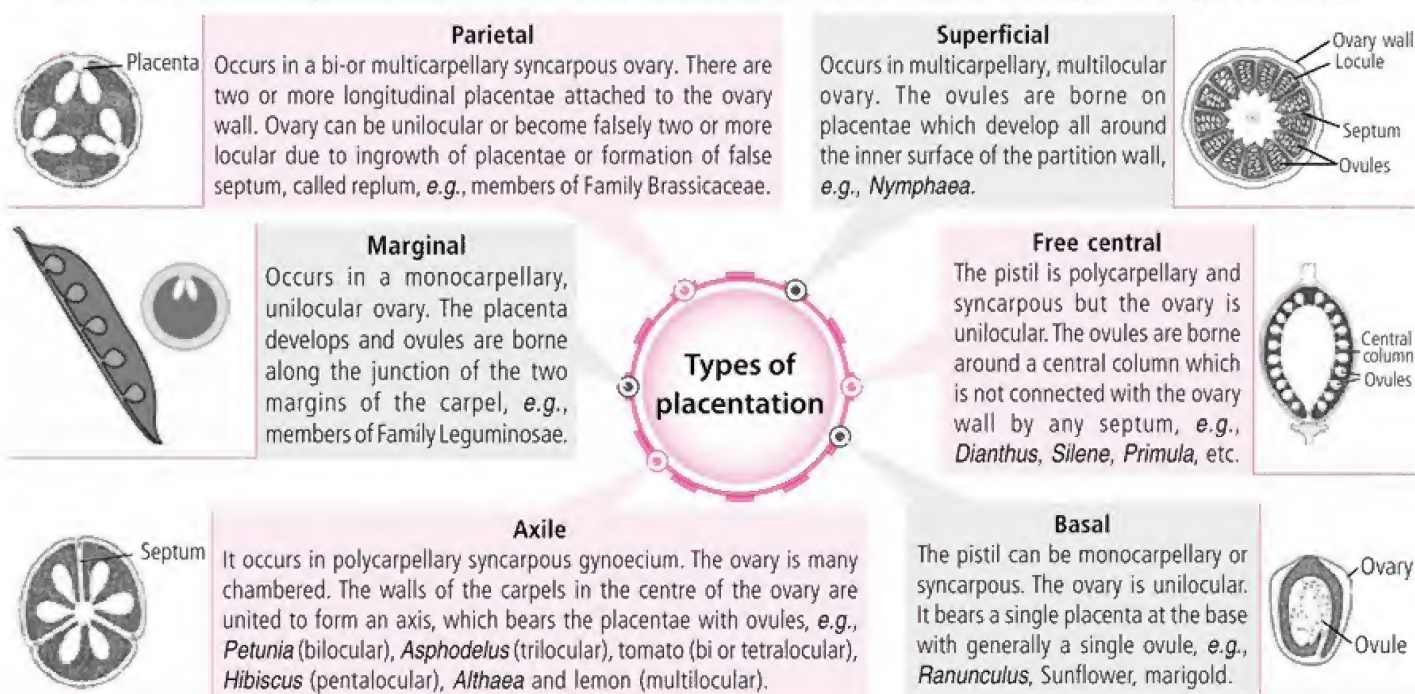
Stylopodium : When base of the style is swollen to form a **pad like structure**, it is called stylopodium, *e.g.*, Family Apiaceae (Umbelliferae).

Plumose stigma : Feather like stigma is called plumose stigma, *e.g.*, grasses.

Resupination : Turning or twisting of ovary of flower through 180°, *i.e.*, upside down is called resupination, *e.g.*, most orchids.

PLACENTATION

- **Placenta** is a parenchymatous cushion present inside the ovary where ovules are borne. An ovary may have one or more placentae. The number, position and arrangement or distribution of placentae inside an ovary is called **placentation**.



FRUIT

- True fruit or **eucarp** is a structure formed from ripened ovary under the influence of ripening ovules and is meant for protecting them. It consists of pericarp formed from the wall of the ovary and seeds formed from ovules. *E.g.*, mango, brinjal, tomato, cucumber, pea, etc. When in formation of a fruit other floral parts, (*e.g.*, thalamus, base of sepal, petals, etc.) participate, it is called false fruit or **pseudocarp**, *e.g.*, apple, pear etc.
- A fruit formed without fertilisation *i.e.*, a seedless fruit is called **parthenocarp**, *e.g.*, banana.

CLASSIFICATION OF FRUITS

- Based on the structure of pericarp, mode of dehiscence and the ovary from which they have developed, fruits are of mainly three types.

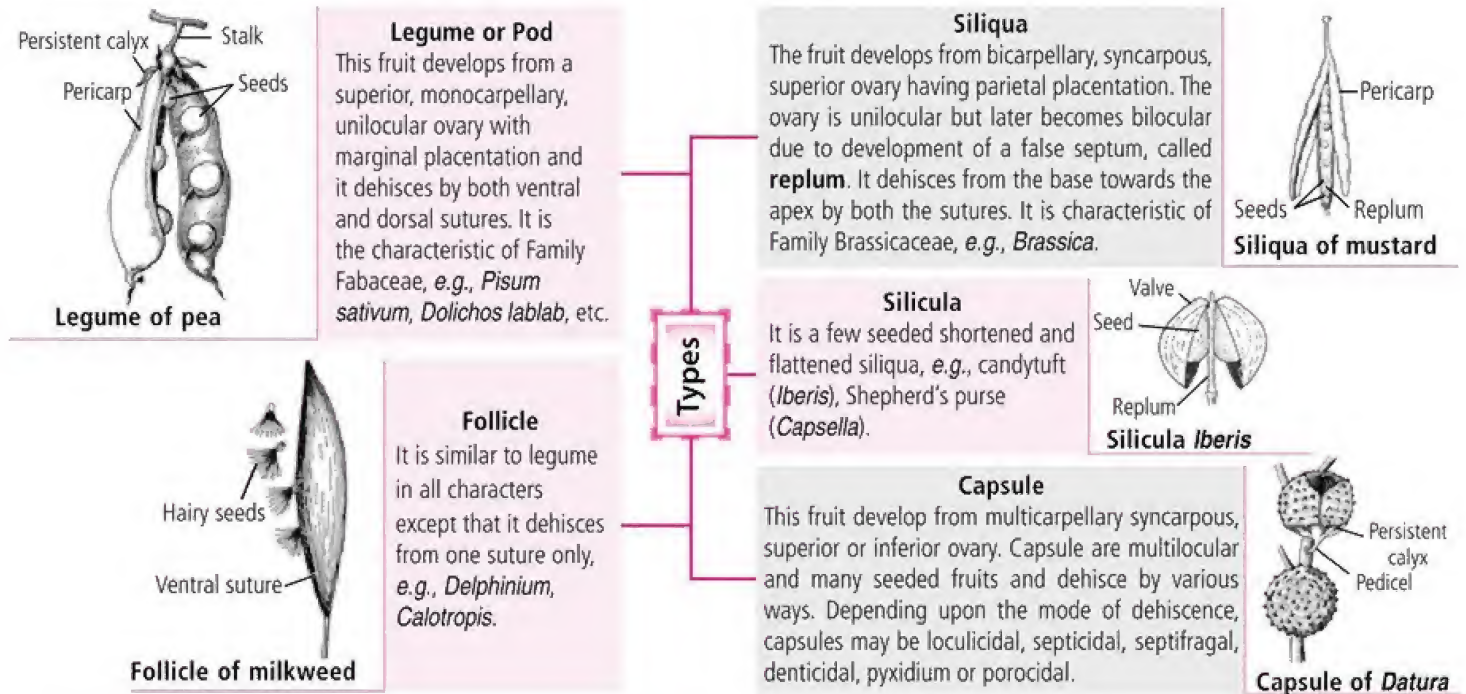
Types of fruits	Simple fruits	Aggregate fruits	Composite fruits
	Develop from monocarpellary or multicarpellary syncarpous ovary.	Develop from the multicarpellary apocarpous ovary.	Develop from the complete inflorescence.

SIMPLE FRUITS

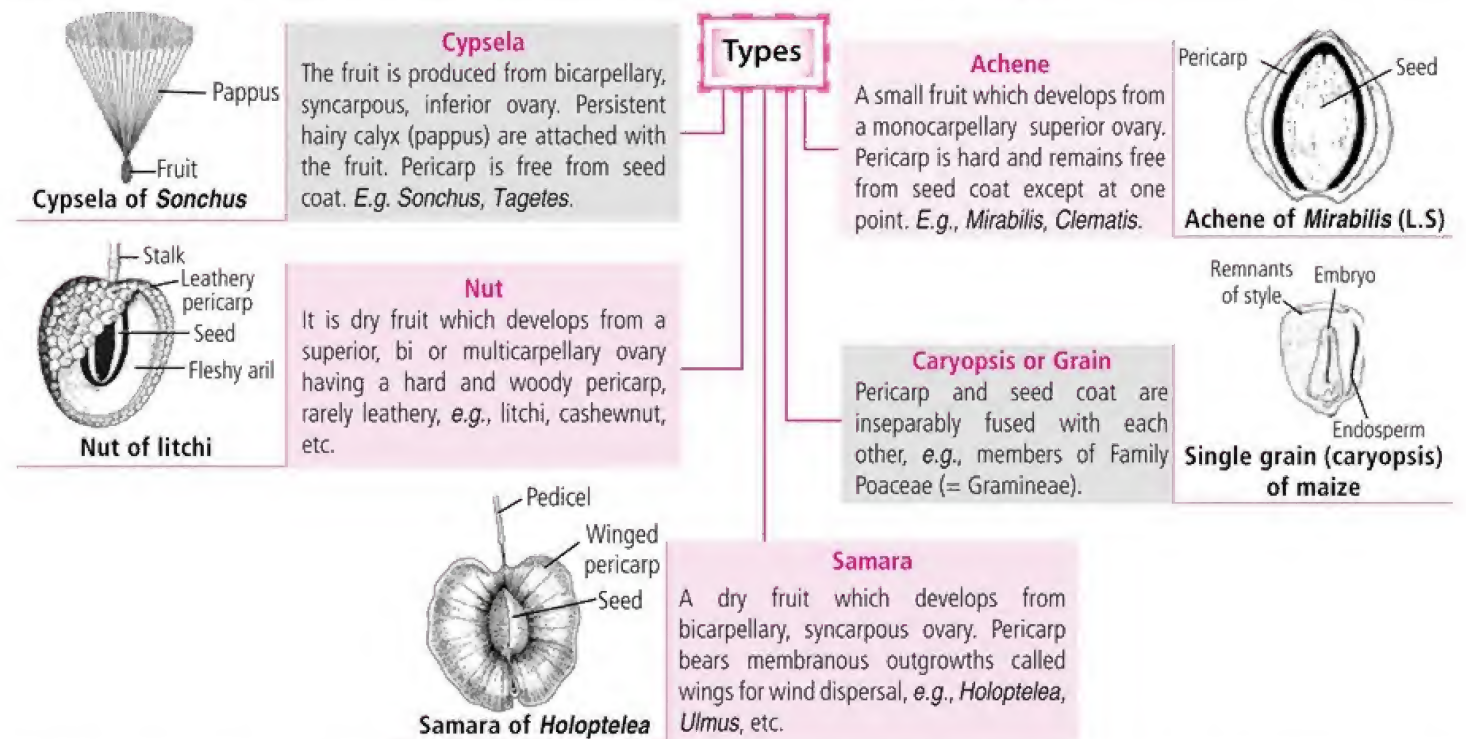
Simple fruits can be simple **dry fruits**, which possess thin, hard and dry pericarp or **succulent fruits** in which pericarp is fleshy, edible and differentiated into epicarp, mesocarp and endocarp.

Simple Dry Fruits

(i) **Capsular or dehiscent fruits** : These fruits are many seeded where pericarp splits open at maturity to expose seeds.



(ii) **Achenial or indehiscent fruits** : These fruits develop from single ovuled ovary having basal placentation and so are single seeded. These fruits do not burst at maturity but only the decaying of pericarp liberates the seeds.

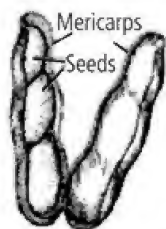


(iii) **Schizocarpic or splitting fruits** : These are many seeded, dry and simple fruits that break up into single seeded parts. The indehiscent single seeded parts are called **mericarps** while the dehiscent ones are termed as **cocci** (singular coccus).

Types

Lomentum

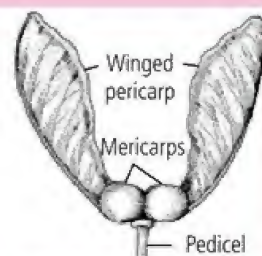
It develops from mono-carpellary, superior, unilocular ovary. The fruit arises just like a legume but when ripened, it forms single seeded mericarps, e.g., *Mimosa pudica*, *Arachis hypogea* etc.



Lomentum of groundnut

Double samara

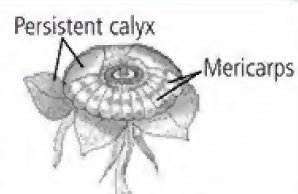
Fruits develop from bicarpellary, syncarpous, superior ovary. Pericarp in these fruits develops in two wings. On maturity the fruit splits up into winged single seeded mericarps, e.g., *Acer*.



Double samara of *Acer*

Carcerulus

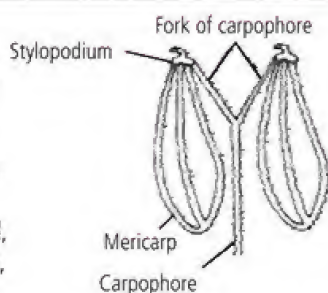
Fruits develop from bicarpellary, syncarpous, superior ovary. Many single seeded mericarps are formed by splitting, e.g., *Althaea*, *Abutilon*, etc.



Carcerulus of *Althaea*

Cremocarp

Bilocular, two-seeded fruits which develop from bicarpellary syncarpous, inferior ovary. On maturation these divide along with carpophore (apically grown part of thalamus) into two mericarps, each having one seed, e.g., *Coriandrum sativum*, carrot, etc.



Cremocarp of coriander

Regma

These fruits develop from multicarpellary pistil. On maturity, the fruits split up into single-seeded dehiscent parts called cocci e.g., *Ricinus*, *Geranium*, etc.



Regma of castor

UNSCRAMBLE ME

Unscramble the words given in column I and match them with their explanations in column II.

Column I

1. EENSNSCECE
2. ICCISLYROTNPO
3. HANSTONELIE
4. GEMOFULACA
5. DANEDNERGE
6. MOEAOLAETC
7. MIBNIASL
8. CITYMSSLPA
9. ONVRENLAIASTI
10. LACTUONEMNRE

Column II

- (a) Plant or animal species needed to be conserved as being in immediate danger of extinction.
- (b) An animal exhibiting bilateral symmetry without body cavity.
- (c) The phase when degeneration sets in structure and functioning of the body.
- (d) The branch of study providing distinct and proper names to organisms to standardise it all over the world.
- (e) The promotion of flowering in plants determined by low temperature.
- (f) The condition when two or more polypeptides are encoded from single mRNA.
- (g) Aquatic organisms that can tolerate only small variations of water salinity.
- (h) The process by which plants uptake water using the way through plasmodesmata.
- (i) A high degree of similarity between an animal and its visual surrounding enabling it to be disguised.
- (j) A recessive genetic disorder in which lack of pigmentation in skin, hair or eyes of an organism occur.

Readers can send their responses at editor@mtg.in or post us with complete address by 25th of every month to win exciting prizes. Winners' names will be published in next issue.

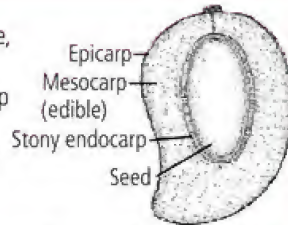
Simple Succulent Fruits

In these fruits, the pericarp and its associated parts become fleshy. These are of following types:

Types

Drupe

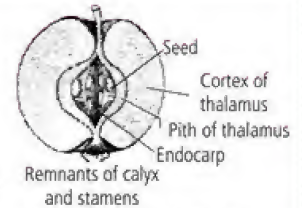
The endocarp is hard and stony. Hence, drupes are also called **stone fruits**. Epicarp forms the outer skin; mesocarp is thick, fleshy, juicy and edible as in mango (*Mangifera indica*) and fibrous as in coconut (*Cocos nucifera*). In cherry, peach, plum and *Zizyphus*, both epicarp and mesocarp are edible.



Drupe of mango (L.S)

Pome

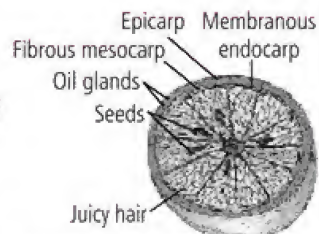
This is false fruit that develops from inferior compound ovary. The outer fleshy part of fruit is thalamus. *E.g.*, apple (*Pyrus malus*), pear (*Pyrus communis*).



Pome of apple (L.S)

Hesperidium

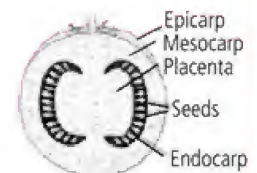
These fruits develop from multicarpellary, syncarpous multilocular, superior ovary with axile placentation. Outer glandular skin is epicarp, the white fluffy stuff is mesocarp and inner membrane surrounding the locules is endocarp. Each loculus of the fruit encloses one or more seeds and a number of edible juicy placental hair, *e.g.*, lemon, orange, etc.



Hesperidium of orange (T.S)

Berry

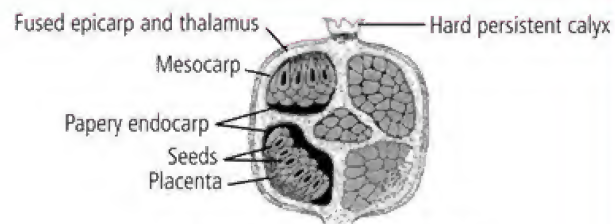
These fruits develop from mono or multicarpellary syncarpous ovary. True berries are derived from superior ovaries and all the 3 layers of their fleshy pericarp are edible, *e.g.*, grape, tomato, etc. False berries are derived from inferior ovaries where epicarp is fused with the thalamus to form exocarp, *e.g.*, guava, banana, etc.



Berry of tomato (L.S)

Balausta

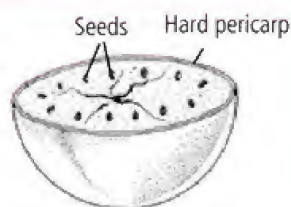
The fruit develops from multilocular, syncarpous, inferior ovary. Testa (outer seed coat) is fleshy and forms edible part of the fruit. Tegmen (inner seed coat) is hard. Pericarp is rough and leathery and seeds are irregularly arranged in the fruit. Fruit has persistent calyx. *E.g.*, pomegranate.



Balausta of pomegranate (L.S)

Amphisarca

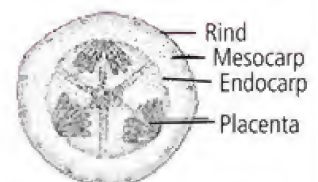
The fruit develops from multicarpellary, syncarpous, superior ovary. Epicarp becomes woody. Mesocarp, endocarp and swollen placenta are eaten, *e.g.*, wood apple (*Aegle marmelos*).



Amphisarca of wood apple (T.S)

Pepo

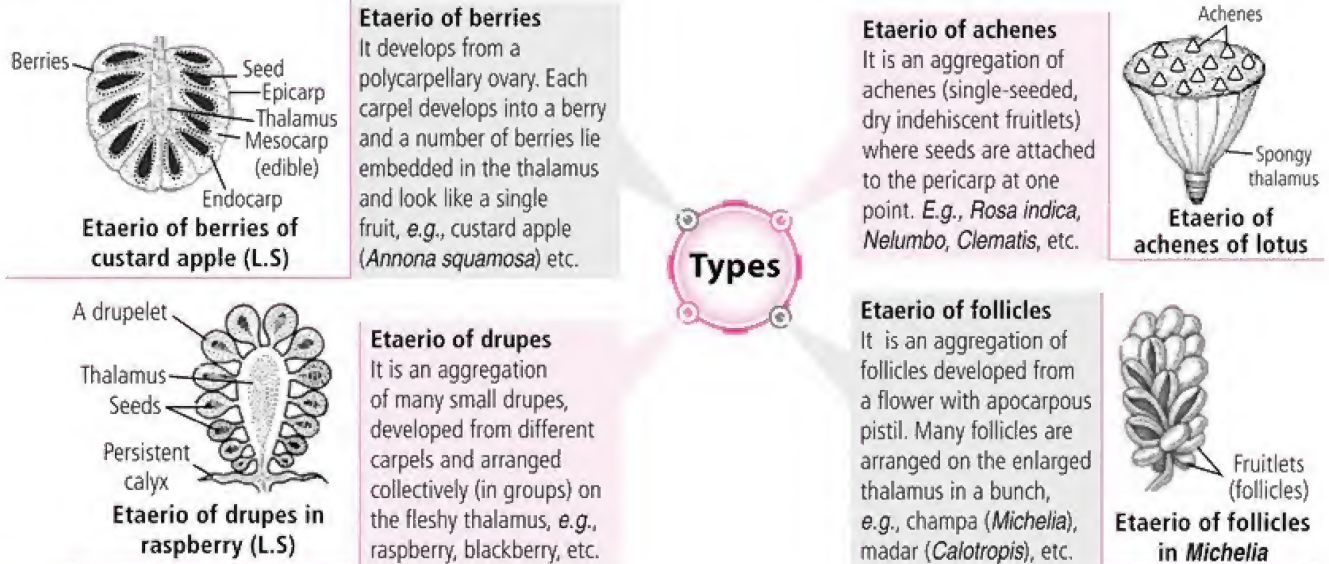
These fruits are special type of false berries that develop from inferior ovary with parietal placentation. Here exocarp of rind does not separate from mesocarp. Rind may or may not be edible. *E.g.*, cucumber (*Cucumis sativa*), etc.



Pepo of cucumber (T.S)

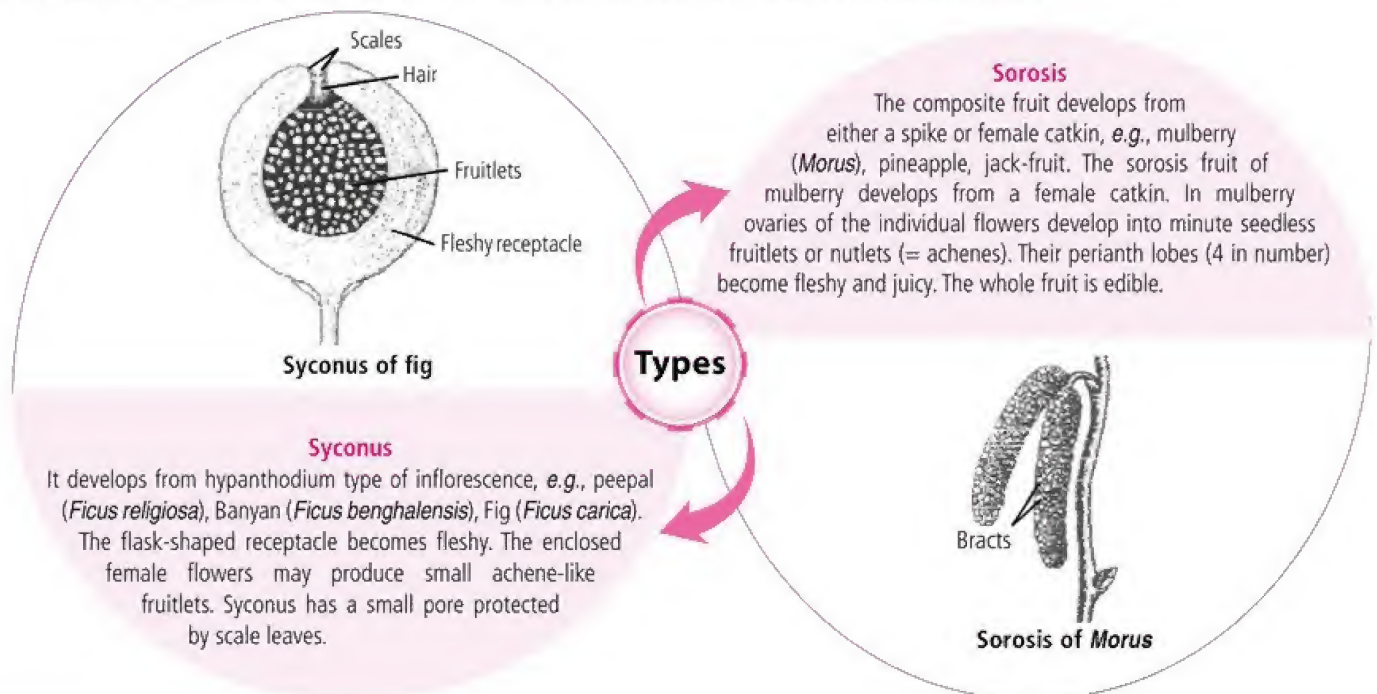
AGGREGATE FRUITS

An aggregate fruit or etaerio is a group of fruitlets which develop from multicarpellary apocarpous ovary. Aggregate fruits are of following main types:



COMPOSITE OR MULTIPLE FRUITS

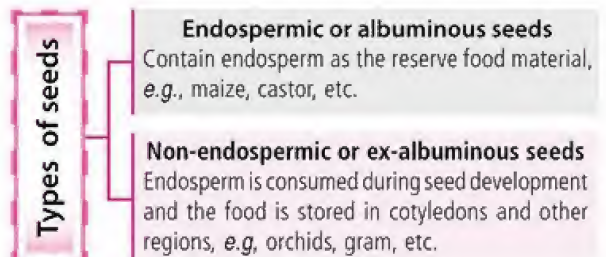
A composite or multiple fruit is a group of fruitlets which develop from flowers of an inflorescence.



SEED

Seed is a ripened ovule which contains an embryo or miniature plant in suspended condition, adequate reserve food for future development of the embryo and a covering for protection against mechanical injury, loss of water, pathogens, etc.

The embryo consists of an axis or **tigellum**, to which are attached, one (in monocotyledonous seeds) or two (in dicotyledonous seeds) seed leaves or **cotyledons**.



Structure of Dicotyledonous Seed

It is a part of funiculus fused with seed wall.

A region from which seed coat originates.

A scar on the seed from where funiculus or stalk of the seed is borne.

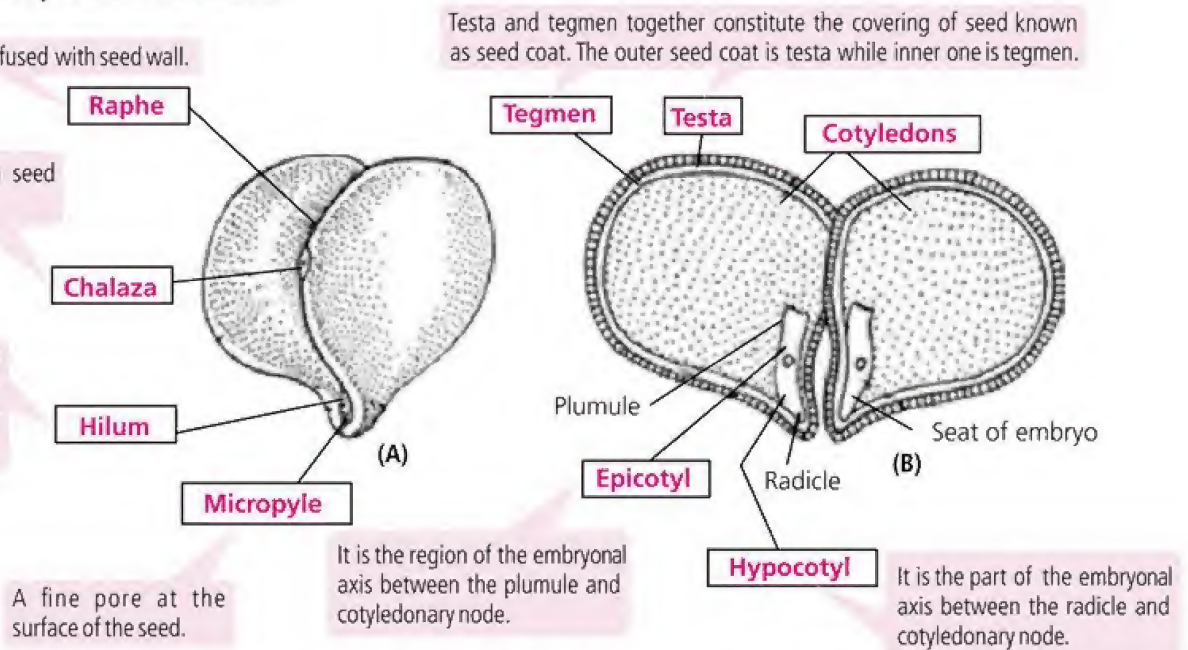


Fig.: Structure of gram seed. (A) Complete seed showing various parts; (B) L.S. of seed

Structure of Monocotyledonous Seed

The monocotyledonous seeds possess a single cotyledon and are generally endospermic.

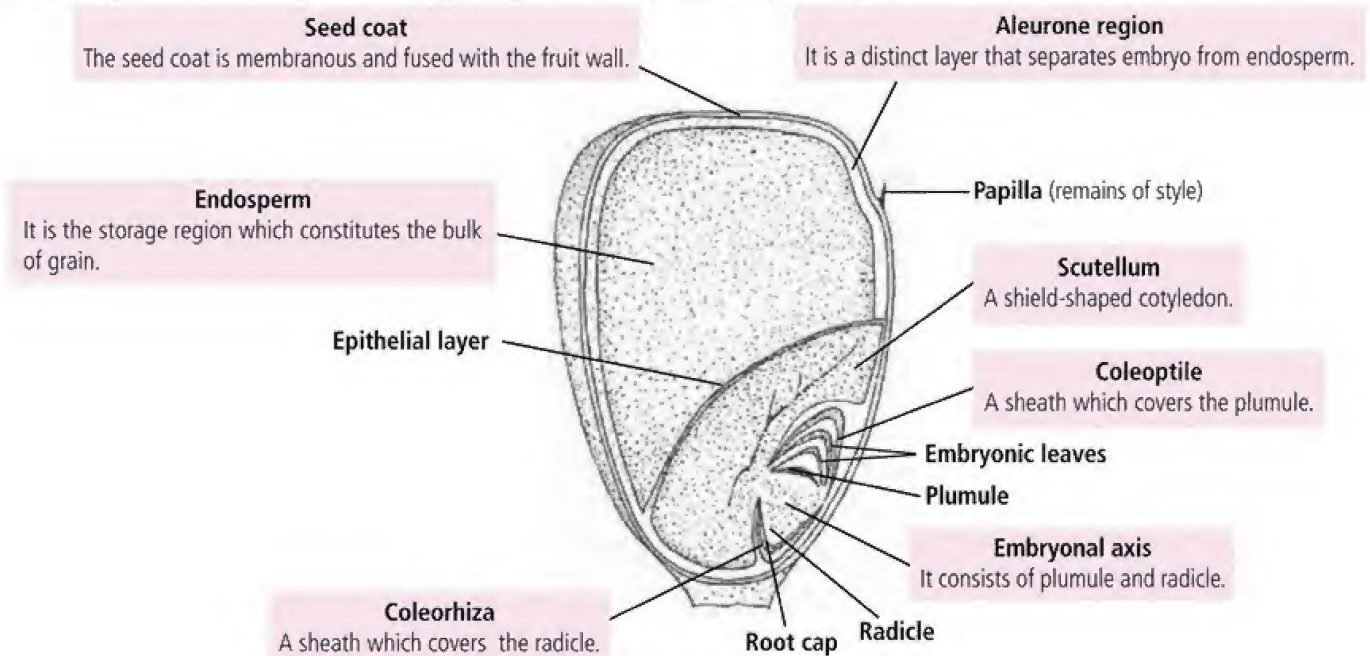


Fig : L.S. of maize grain (seed)

Recalcitrant seeds are those seeds that get killed on reduction of moisture and exposure to low temperature, *e.g.*, *Cocos*, *Thea* and *Artocarpus*.


Orthodox seeds are those that can be stored for long as they can tolerate reduction in moisture content (upto 5%), exposure to anaerobic conditions and low temperature *e.g.*, legumes and cereals.

DESCRIPTION OF FLOWERING PLANT

- Various terms and terminologies discussed here are used to describe the plant so as to identify and place it within the appropriate taxonomic ranks. The various terms used are the habit, lifespan (annual, biennial, etc), habitat, type of roots and their modifications, stem and its types, leaves, their types and arrangements, venation, etc., inflorescence, characteristics of a flower and its different parts, types of fruit and seed.

Floral Formula

- It is a symbolic representation of floral symmetry, presence or absence, number, cohesion and adhesion of various parts. It also informs whether the flower is bracteate or ebracteate its symmetry, sexuality, number and union of sepals, petals, stamens and carpels. All these conditions are represented by various symbols, which are summarised below:
- Symbols used to write floral formula**

Br	–	Bracteate	P	–	Perianth
Ebr	–	Ebracteate	A	–	Androecium
⊕	–	Actinomorphic or regular flower	G	–	Gynoecium
%	–	Zygomorphic or irregular flower	<u>G</u>	–	Superior ovary
(♂)	–	Bisexual flower	<u>G</u>	–	Inferior ovary
♀	–	Female flower	1, 2, 3, 4, ... ∞	–	Number of sepals, petals, stamens or carpels
♂	–	Male flower	()	–	Fused or united, e.g., C ₍₅₎ , i.e., five petals of corolla fused
K	–	Calyx	 A	–	Epipetalous condition, i.e., stamens attached to petals
C	–	Corolla			

Floral Diagram

- It is a diagrammatic representation of the pooled up informations from transverse sections of the flower bud in relation to mother axis.

DESCRIPTION OF SOME IMPORTANT FAMILIES

Table : A comparative account of Families Fabaceae, Solanaceae and Liliaceae

Characters	Fabaceae	Solanaceae	Liliaceae
Systematic position	Class – Dicotyledonae Subclass – Polypetalae Series – Calyciflorae Order – Rosales Family – Fabaceae	Class – Dicotyledonae Subclass – Gamopetalae Series – Bicarpellatae Order – Polemoniales Family – Solanaceae	Class – Monocotyledoneae Series – Coronarieae Order – Liliales Family – Liliaceae
Inflorescence	Raceme or spike (panicle in <i>Dalbergia</i>)	Axillary or extra-axillary cyme, rarely solitary axillary (<i>Petunia</i>) or terminal (<i>Datura</i>)	Racemose, sometimes solitary or umbellate
Flower	Bisexual, zygomorphic, bracteate or ebracteate, pedicellate or sessile, perigynous occasionally hypogynous, pentamerous	Bisexual, actinomorphic, ebracteate or bracteate, pedicellate, hypogynous, pentamerous, cyclic	Bisexual, actinomorphic, zygomorphic in few cases, bracteate or ebracteate, pedicellate, complete or incomplete, unisexual in <i>Ruscus</i> and <i>Smilax</i> , hypogynous, generally pentacyclic, trimerous
Calyx	Sepals five, gamosepalous, valvate or imbricate aestivation, usually campanulate	Sepals five, gamosepalous, valvate aestivation, persistent, accrescent (<i>Physalis</i>), campanulate or tubular, hairy	Perianth : Tepals six (3 + 3), often united into tube, valvate or imbricate aestivation, sepaloid or petaloid
Corolla	Petals five, polypetalous, papilionaceous, imbricate aestivation	Petals five, variously shaped, infundibuliform, campanulate, rotate, united, valvate aestivation, plicate or folded like a fan in bud	

Androecium	Ten, usually diadelphous [(9) + 1], anthers dithecous, introrse dehiscence longitudinal	Stamens five, epipetalous, filaments free, anthers bithecous, basifixed or dorsifixed, introrse, longitudinal or porous dehiscence	Stamens six (3 + 3), free or monadelphous (e.g., <i>Ruscus</i>), epiphyllous, basifixed, dorsifixed, or versatile anther, longitudinal dehiscence
Gynoecium	Ovary superior, monocarpellary, unilocular with many ovules, marginal placentation	Bicarpellary, syncarpous, ovary superior, bilocular, sometimes tetralocular due to false septum, placenta swollen with many ovules, axile placentation, ovary is obliquely placed	Tricarpellary, syncarpous, superior ovary, trilocular with 2 to many ovules, axile placentation, rarely parietal, styles united or separate, stigma free or fused, trilobed
Fruit	Legume rarely lomentum	Berry or capsule	Capsule, rarely berry
Seeds	One to many, non-endospermic	Many, endospermic	Endospermic
Floral formula	% ♀ $K_{(5)} C_{1+2+(2)} A_{1+(9)} \underline{G}_1$	$\oplus \text{♀} K_{(5)} \widehat{C}_{(5)} A_5 \underline{G}_{(2)}$	$\text{♀} \overbrace{P_{3+3} \text{ or } (3+3)}^{A_{3+3}} \underline{G}_{(3)}$
Floral diagram			

SPEED PRACTICE

- Petunia* has 5 sepals, 5 petals, 5 stamens and 2 carpels. It is a type of
 - pentamerous flower
 - isomerous flower
 - heteromerous flower
 - bimerous flower.
- When sepals are fused together to form calyx, it is termed as
 - gamosepalous
 - gamopetalous
 - polysepalous
 - spurred.
- Vexillum is found in Family
 - Caryophyllaceae
 - Papilionaceae
 - Rosaceae
 - Brassicaceae.
- Read the given statements and select the correct ones.
 - The flower of *Brassica* is zygomorphic.
 - The flower of *Datura* is actinomorphic.
 - A flower which cannot be divided into two equal parts by vertical plane is called asymmetric flower.
 - Actinomorphic flowers do not have radial symmetry.
 - (i) and (ii)
 - (iii) and (iv)
 - (ii) and (iii)
 - All of these
- Select the option that correctly fills the given blanks.
 - In _____ anther, filament joins the anther at its base.
 - In _____ anther, filament is firmly fixed to the back of the anther.
 - In _____ anther, filament is attached to the back of the anther and it can swim freely.
 - In _____ anther, filament runs throughout the length of the anther or become continuous with the connective.
 - basifixed
 - dorsifixed
 - versatile
 - adnate
 - basifixed
 - adnate
 - versatile
 - dorsifixed
 - adnate
 - basifixed
 - dorsifixed
 - versatile
 - adnate
 - dorsifixed
 - versatile
 - basifixed
- Identify A, B, C and D (aestivations) from the given figure and choose the correct option.

A

B

C

D

 - A-*Brassica*, B-China rose, C-*Cassia*, D-Pea
 - A-China rose, B-*Brassica*, C-*Cassia*, D-Pea
 - A-Pea, B-*Brassica*, C-China rose, D-*Cassia*
 - A-*Brassica*, B-*Cassia*, C-China rose, D-Pea

7. Replum, a false septum that develops between two parietal placentae is found in
 (a) *Argemone* (b) *Capparis*
 (c) mustard (d) pea.

8. Read the given statements and select the correct option.
Statement A : In apocarpous ovary the flower has several free ovaries.

Statement B : On maturity, apocarpous ovary forms fruitlet of aggregate type.

- (a) Both statements A and B are correct and B is the correct explanation of A.
 (b) Both statements A and B are correct but B is not the correct explanation of A.
 (c) Statement A is correct but B is incorrect.
 (d) Both statements A and B are incorrect.
9. Match the column I with column II and select the correct option.

Column I	Column II
A. Sunflower	(i) Stamen
B. Simple fruit	(ii) Basal placentation
C. Polyandrous	(iii) Syncarpous ovary
D. Hypogynous	(iv) Superior ovary

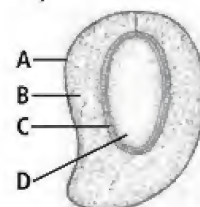
- (a) A-(ii), B-(iv), C-(i), D-(iii)
 (b) A-(iv), B-(iii), C-(i), D-(ii)
 (c) A-(ii), B-(i), C-(iii), D-(iv)
 (d) A-(ii), B-(iii), C-(i), D-(iv)
10. In eucarp or true fruit, pericarp is formed from
 (a) ovary wall fused with thalamus
 (b) ovary wall only
 (c) ovary wall fused with base of sepals
 (d) ovary wall fused with petals.
11. Banana is an example of
 (a) aggregate fruit (b) capsular fruit
 (c) schizocarpic fruit (d) succulent fruit.
12. Which one of the following statements about apple is incorrect?
 (a) Fruit is simple, succulent, pome.
 (b) Fruit develops from an inferior compound ovary.
 (c) It is a true fruit.
 (d) The remains of sepals and stamens occur at the free end.
13. Read the given statements related with coconut and select which ones are true (T) and which one are false (F).
 (i) Fruit has a membranous epicarp.
 (ii) The watery fluid is called "milk of coconut".
 (iii) The fibrous endocarp yields coir.
 (iv) It is a type of fibrous berry.

	(i)	(ii)	(iii)	(iv)
(a)	T	T	T	F
(b)	T	T	F	F
(c)	F	T	F	T
(d)	F	F	T	T

14. Cucumber is a type of
 (a) berry (b) pepo (c) drupe (d) pome.

15. Read the given statements and select the correct ones.
 (i) Aggregate fruit develops from an inflorescence.
 (ii) Composite fruit develops from a single flower.
 (iii) The fruit of fig is syconus.
 (iv) *Trapa* has drupe type of fruit.
 (a) (i) and (iii) (b) (i) and (ii)
 (c) (iii) and (iv) (d) (iii) only

16. Identify A, B, C and D from the given figure of a fruit and select the correct statement regarding them.



- (i) A, B and C are parts of pericarp.
 (ii) B is stony part of this fruit.
 (iii) The type of fruit is pome.
 (iv) B is pulpy and edible.
 (a) (i) and (iv) (b) (i), (iii) and (iv)
 (c) (ii) and (iii) (d) (iv) only

17. Read the given statements and select the correct option.
Statement A : Endosperm is the food storing tissue of a seed.
Statement B : In flowering plants endosperm is produced as a result of double fertilisation.
 (a) Both statements A and B are true and B is the correct explanation of A.
 (b) Both statements A and B are true but B is not the correct explanation of A.
 (c) Statement A is correct but B is incorrect.
 (d) Both statements A and B are incorrect.

18. Match the column I with column II and select the correct option.

Column I	Column II
A. Carpophore	(i) <i>Silene</i>
B. Gynophore	(ii) <i>Passiflora</i>
C. Anthophore	(iii) <i>Cleome</i>
D. Androphore	(iv) Coriander

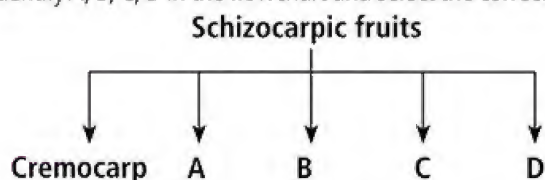
- (a) A-(iv), B-(iii), C-(i), D-(ii)
 (b) A-(ii), B-(i), C-(iii), D-(iv)
 (c) A-(iv), B-(i), C-(iii), D-(ii)
 (d) A-(ii), B-(iv), C-(i), D-(iii)
19. Read the given statements and select the incorrect option.
 (a) The purpose of fruit formation is to protect the seed against desiccation during their growth to maturity.
 (b) Caryopsis is a true fruit.
 (c) Nut is single-seeded, dehiscent, dry fruit.
 (d) All of the cereals are single-seeded fruits.
20. Read the given statements and select which ones are true (T) and which one are false (F).
 I. A fertile and completely developed pistil is called pistillode.
 II. Sepals are persistent in poppy.
 III. The cotyledons of castor oil seed have palmate venation.
 IV. Diplostemonous stamens are present in *Cassia*.

	I	II	III	IV
(a)	T	T	F	T
(b)	T	F	T	F
(c)	F	F	T	T
(d)	F	T	F	T

21. Study the given table and identify A, B, C and D.

Name	Type of fruit	Fleshy part
Date Palm	Berry	A
Mango	B	Mesocarp
Litchi	C	Aril
Pineapple	Sorosis	D

- (a) A-Endocarp, B-Drupe, C-Pome, D-Peduncle
 (b) A-Pericarp, B-Drupe, C-Nut, D-Peduncle
 (c) A-Mesocarp, B-Berry, C-Nut, D-Fleshy thalamus
 (d) A-Pericarp, B-Drupe, C-Sorosis, D-Peduncle
22. Select the correct statement about placentation.
 (a) Axile placentation occurs in syncarpous pistil.
 (b) In free central placentation, the ovule bearing column is attached to the wall of the ovary by septa.
 (c) The ovary is always multilocular in marginal placentation.
 (d) Parietal placentation is present in *Ranunculus*.
23. The given flowchart depicts types of schizocarpic fruits. Identify A, B, C, D in the flowchart and select the correct option.



- (a) A-Follicle, B-Carcerulus, C-Regma, D-Nut
 (b) A-Lomentum, B-Carcerulus, C-Compound samara, D-Regma
 (c) A-Amphisaria, B-Balausta, C-Compound samara, D-Sorosis
 (d) A-Hesperidium, B-Sorosis, C-Berry, D-Lomentum
24. Which of the following statement is incorrect?
 (a) Coleoptile is a conical protective sheath over radicle.
 (b) Coleoptile and coleorrhiza are present in monocot seeds.
 (c) In dicot seeds plumule lies in between the two cotyledons.
 (d) Aleurone layer is absent in dicot seeds.
25. Identify the correct statement about corolla.
 (a) Campanulate corolla is present in *Bryophyllum*.
 (b) Urn-shaped corolla is present in *Clerodendron*.
 (c) Corolla is bilipped in sunflower.
 (d) Corolla is shaped like a funnel in *Petunia*.
26. Which of the following statements is correct about dehiscence of fruits?

- (a) Dehiscence in *Luffa* takes place by means of apical teeth present in the capsule.
 (b) The fruit dehisces by longitudinal slits present on the dorsal sutures of the ovary in *Portulaca*.
 (c) The fruit dehisces by means of pores in poppy.
 (d) In *Datura*, fruit dehisces by longitudinal slits that appear along the middle of septa.

27. Match the following and select the correct option.

Column I Plant	Column II Floral formula
A. <i>Withania somnifera</i>	(i) $\% \text{ } \text{K}_{(5)} \text{C}_{1+2+(2)} \text{A}_{(9)} \underline{\text{G}}_1$
B. <i>Dalbergia sissoo</i>	(ii) $\oplus \text{ } \text{K}_{(5)} \text{C}_5 \text{A}_5 \text{G}_{(2)}$
C. <i>Foeniculum vulgare</i>	(iii) $\oplus \text{ } \text{K}_{(5)} \text{C}_{(5)} \text{A}_5 \text{G}_{(2)}$
D. <i>Chenopodium album</i>	(iv) $\oplus \text{ } \text{P}_{3+3} \text{A}_{3+3} \text{G}_{(3)}$
E. <i>Rhoeo discolor</i>	(v) $\oplus \text{ } \text{P}_5 \text{A}_5 \text{G}_{(3)}$

(a) A-(iii), B-(i), C-(ii), D-(v), E-(iv)
 (b) A-(iii), B-(ii), C-(v), D-(iv), E-(i)
 (c) A-(ii), B-(iii), C-(i), D-(v), E-(iv)
 (d) A-(ii), B-(v), C-(iv), D-(iii), E-(i)

28. Perianth represented by two teeth like lodicules is present in
 (a) *Canna hybrida* (b) *Ricinus communis*
 (c) *Beta vulgaris* (d) *Avena sativa*.

29. Match the column I with column II and select the correct option.

Column I	Column II
A. <i>Asparagus</i>	(i) Berry
B. <i>Atropa belladonna</i>	(ii) Legume
C. Solanaceae	(iii) Liliaceae
D. <i>Vicia faba</i>	(iv) Pain relief

(a) A-(ii), B-(iv), C-(iii), D-(i)
 (b) A-(iii), B-(iv), C-(i), D-(ii)
 (c) A-(ii), B-(iii), C-(i), D-(iv)
 (d) A-(iii), B-(i), C-(ii), D-(iv)

30. The type of fruit constricted in between the seeds is called
 (a) amphisarca (b) balausta
 (c) lomentum (d) siliqua.

ANSWER KEY

1. (c)	2. (a)	3. (b)	4. (c)	5. (a)
6. (a)	7. (c)	8. (a)	9. (d)	10. (b)
11. (d)	12. (c)	13. (b)	14. (b)	15. (c)
16. (a)	17. (b)	18. (a)	19. (c)	20. (c)
21. (b)	22. (a)	23. (b)	24. (a)	25. (d)
26. (c)	27. (a)	28. (d)	29. (b)	30. (c)





NEET ESSENTIAL

The syllabus for NEET is very vast which impedes students from acquiring indepth knowledge and covering the entire syllabus at the same time. An essential topic for NEET is therefore presented here to enable students grasp the topic, analyse the type of questions and SCORE HIGH.

ANIMAL TISSUES - I

In a complex multicellular organism, all functions like digestion, respiration, reproduction, etc., are carried out by different groups of cells arranged in a well organised manner. Such a group of similar cells along with intercellular substances having similar origin and performing a specific function, constitute **tissue**.

The study of tissues is called **histology** (Mayer, 1819).

TYPES OF TISSUE

Table : Types of tissue on the basis of location and function

Type	Epithelial tissue	Connective tissue	Muscular tissue	Nervous tissue
Origin	Ectoderm, mesoderm, endoderm	Mesoderm	Mesoderm	Ectoderm
Function	Protection, secretion, absorption	Storage, support, protection, transport	Movement, locomotion	Control and coordination by nerve impulse

EPITHELIAL TISSUE

An epithelium or epithelial tissue is composed of one or more layers of cells covering the external and internal surfaces of various body parts. Epithelial tissue also forms glands.

Epithelial membranes are derived from all three germ layers. The epidermis, derived from ectoderm, constitutes the outer portion of the skin while the inner surface of the digestive tract is lined by an epithelium derived from endoderm and the inner surfaces of the body cavities are lined by an epithelium derived from mesoderm.

Epithelial tissue usually rests on a thin non-cellular basement membrane composed of outer thin **basal lamina** consisting of mucopolysaccharides and glycoproteins and **fibrous** or **reticular lamina** consisting of collagen or reticular fibres of the underlying connective tissue.

These tissues generally lack blood vessels but still have a good power of repair after injury.

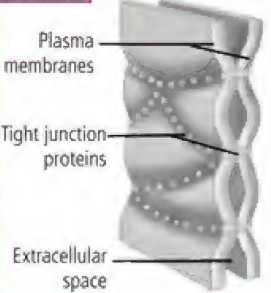
They receive useful materials from the blood vessels of the connective tissue across the basement membrane and transfer waste matter to the blood in the same way.

Specialised Junctions Between Epithelial Cells

These are of five types:

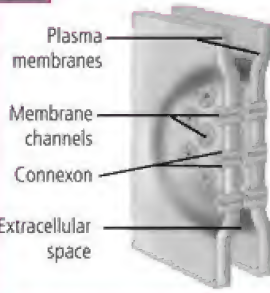
1 Tight junctions

Tight junctions (**Occluding junctions, Zonula occludens**) are regions where the membranes of adjacent animal cells are held close together by **sealing strands**. They tie the cells firmly and check the movement of materials between them. They are abundant in epithelia of collecting tubules of kidney.



2 Gap junctions

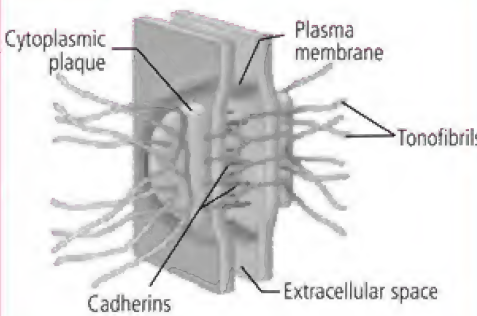
Gap junctions (**Communicating junctions, Maculae communicantes, Nexus**) are fine hydrophilic channels between adjacent cells formed with the help of protein cylinders called **connexons**. Each connexon has six protein subunits or nexins. pH and Ca^{2+} ion concentration control opening, narrowing or closure of channels. These junctions allow chemical exchange between adjacent cells. They are found in electrically coupled cells.



3 Adhering junctions

Adhering junctions perform cementing function to keep neighbouring cells together. They are of following three types :

- (i) **Desmosomes (Spot desmosomes, Macula adherens)** are plaque-like areas which provide strong mechanical attachment between two adjacent cells with the help of adhesion molecules and filaments (**tonofibrils**). They have intercellular proteins. Desmosomes occur in areas where strong cohesion is required.
- (ii) **Hemi-desmosomes** are like half desmosomes which form anchoring between bases of epithelial cells and the underlying basement membrane. Adhesion molecules connect them with collagen fibrils and other components of basement membrane.
- (iii) **Terminal bars (Adhesive belts, Zonula adherens)** : A dense undercoat is present on the cytoplasmic side of plasma membrane, but it consists of web of microfilaments and intermediate filaments. Adherence is through **cadherins**.



4 Interdigitations

These are finger-like processes of cell membrane of adjacent cells. They enhance adherence and increase surface area for mutual exchange.

5 Intercellular bridge

These are projections from adjacent cells into common intercellular space that come in contact with one another for quick transfer of stimuli.

Table : Structure, location and function of different epithelia

Types	Structure	Location	Function
I. Simple Epithelia (Unilayered Epithelia)			
Simple squamous epithelium	Composed of a single layer of flat, tile-like polygonal cells . The nuclei of the cells are flattened and often lie at the centre of the cells making a bulge at the cell's surface. In the blood vessels and heart, it is called endothelium . In the coelom, it is called mesothelium .	Present in the terminal bronchioles and alveoli of the lungs, wall of the Bowman's capsules and descending limb of loop of Henle, membranous labyrinth (internal ear), blood vessels, lymph vessels, heart, coelomic cavities and rete testis.	Protection, excretion, gas exchange and secretion of coelomic fluid.

Simple cuboidal epithelium	Consists of short, cube-shaped cells . Nuclei are located in the centre of the cell. The cells of cuboidal epithelium often form microvilli on their free surface which gives a brush-like appearance to their free border, hence, also called brush bordered cuboidal epithelium . Microvilli increase absorptive surface area also.	Present in the small salivary and pancreatic ducts, thyroid vesicles, parts of membranous labyrinth, proximal and distal convoluted tubules of the nephrons of kidneys, ovaries, seminiferous tubules, ciliary bodies, choroid and iris of eyes. Other sites are the inner surface of the lens, the pigment cell layer of the retina and sweat glands.	Protection, secretion, absorption, excretion and gamete formation.
Simple columnar epithelium	Elongated cells are placed side by side like column. The outer free surface of each cell is slightly broader. The nuclei are somewhat elongated along the axis of the cells. Nuclei lie near the bases of the cells. Certain cells of this epithelium contain mucus (a slimy substance) and are called goblet (or mucous) cells . The epithelium containing mucus secreting cells, along with the underlying supporting connective tissue is called mucosa or mucous membrane .	Found in the lining of the stomach, intestine, gall bladder and bile duct. It also forms the gastric glands, intestinal glands and pancreatic lobules where it has secretory role and is called glandular epithelium . Intestinal mucosa have microvilli to increase absorptive surface area, it is called brush bordered columnar epithelium .	Protection, secretion and absorption.
Simple ciliated epithelium	Numerous delicate hair-like outgrowths, the cilia are found on their apical surfaces. Mucus secreting goblet cells also occur in the ciliated epithelium. It is of two types: (i) Ciliated columnar epithelium : Columnar cells that have cilia on the free surface. (ii) Ciliated cuboidal epithelium : Cubical cells that have cilia on the free surface.	Lines most of the respiratory tract and Fallopian tubes (oviducts), ventricles of brain and central canal of spinal cord, tympanic cavity of middle ear and auditory tube (Eustachian tube). Occurs in certain parts of nephrons of the kidneys.	Maintenance as well as movement of mucus, urine, eggs and cerebrospinal fluid in particular direction. In nephrons of kidneys, the cilia helps in the movement of urine.
Pseudostratified epithelium	Cells are columnar , but unequal in size . Long cells extend up to free surface while short cells do not reach the outer free surface. Long cells have oval nuclei, and short cells have rounded nuclei. Mucus secreting goblet cells are also present in this epithelium. Epithelium is one cell thick, but it appears to be multilayered which is due to the fact that the nuclei lie at different levels in different cells. Hence, it is called pseudostratified epithelium. It is of two types: (i) Pseudostratified columnar epithelium ; (ii) Pseudostratified columnar ciliated epithelium .	Pseudostratified columnar epithelium occurs in the large ducts of parotid salivary glands, the urethra of the human male and in the olfactory mucosa. Pseudostratified columnar ciliated epithelium occurs in the trachea and large bronchi. The movements of the cilia propel the mucus and foreign particles towards the larynx.	Protection, secretion, movement of secretions from glands, urine and semen in male urethra and mucus loaded with dust particles and bacteria from the trachea towards the larynx.

II. Compound Epithelia (Multilayered Epithelia)

(a) Stratified epithelium

Stratified squamous epithelium	Consists of several cell layers. In the deepest layers, the cells are mainly columnar and as they grow towards the surface they become flattened. It is of following two types: (i) Keratinised stratified squamous epithelium : In the outer few layers, the cells replace their cytoplasm with a hard, water proof protein, the keratin . These layers of dead cells are called stratum corneum or horny layer . (ii) Non-keratinised stratified squamous epithelium : It lacks keratin and is unable to check water loss and provides only moderate protection against abrasion.	Occurs in the epidermis of the skin of land vertebrates. Occurs in the oral cavity (buccal cavity), tongue, pharynx, oesophagus, anal canal, lower parts of urethra, vocal cords, vagina, cervix (lower part of uterus), conjunctiva, inner surface of eyelids and cornea of eye.	Protection of underlying structure against drying out, abrasions and infection.
Stratified cuboidal epithelium	Consists of outer layer of cuboidal cells and basal layer of columnar cells.	Forms the epidermis of fishes and many urodeles (tailed amphibians such as salamanders). It also lines the sweat gland ducts and larger salivary and pancreatic ducts.	Protection
Stratified columnar epithelium	Columnar cells present in both superficial and basal layers.	Covers the epiglottis and lines mammary gland ducts and parts of urethra.	Secretion and protection
Stratified ciliated columnar epithelium	Outer layer consists of ciliated columnar cells and basal layer of columnar cells.	Lines the larynx and upper part of the soft palate.	Movement of secretions

(b) Transitional epithelium

Also known as Urothelium	Consists of 4 to 6 layers of cells . The cells of deepest (= basal) layer are columnar or cuboidal while the cells of middle layer are polyhedral or pear-shaped. The cells of the surface layer are large and globular or umbrella shaped. When the epithelium is stretched, all the cells become flattened.	Found in the renal calyces, renal pelvis, ureter urinary bladder and part of the urethra. Because of its distribution, it is also called urothelium (epithelium present in the urinary system). The transitional epithelium of the urinary bladder can be stretched considerably without being damaged.	Permits distention. It is also protective in function
--------------------------	--	--	---

Spellathon Winners

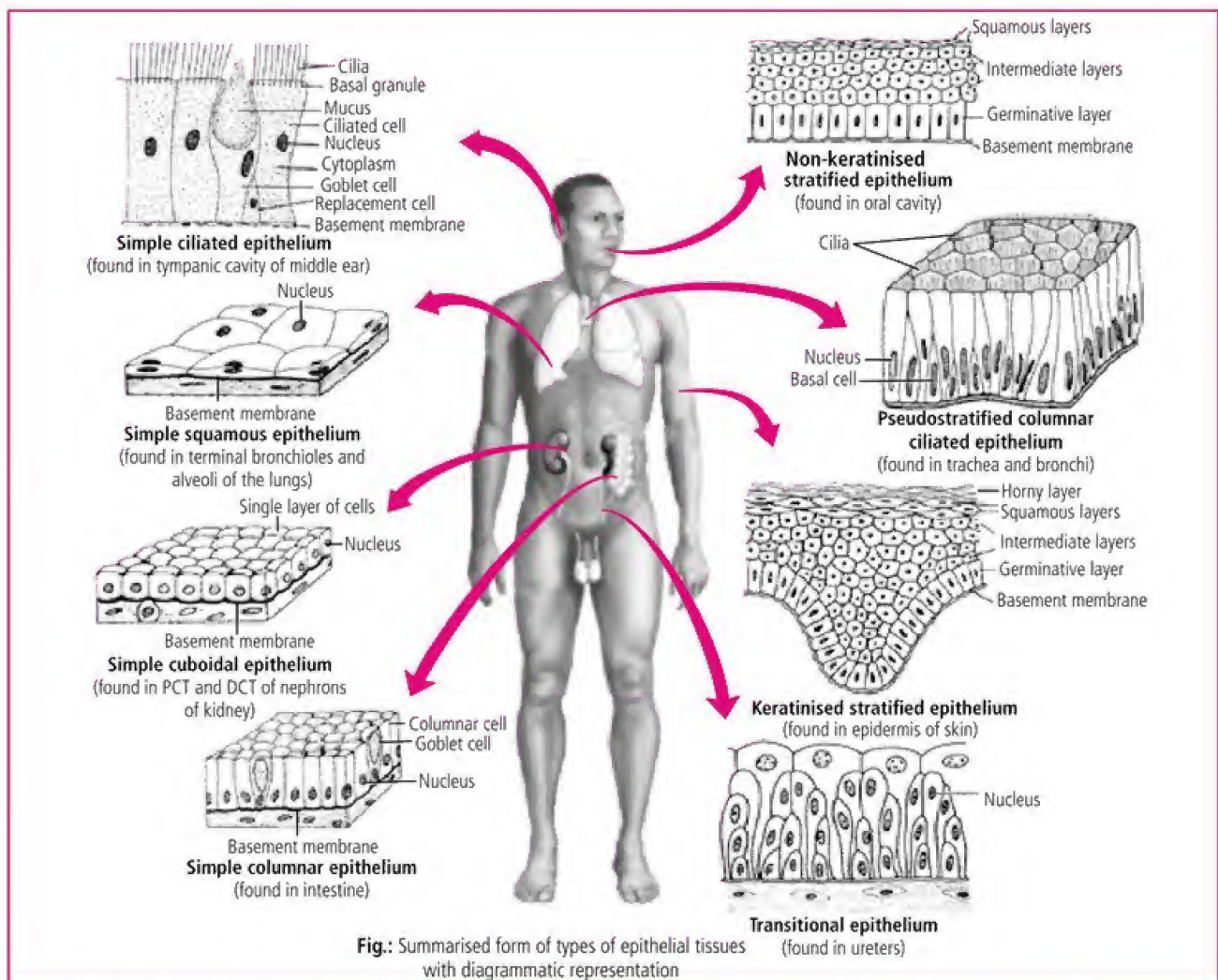
December-2017

1. Neha Joshy - Alappuzha, Kerala
2. D.B. Rakshit Narayan
- Annanagar, Chennai

MEMORY CCpsule

To easily remember the five classes of Echinoderms, the mnemonic "All Have Calcareous Ossicle Endoskeleton" can be used as follows:

All	:	Asteroidea
Have	:	Holothuroidea
Calcareous	:	Crinoidea
Ossicle	:	Ophiuroidea
Endoskeleton	:	Echinoidea



Glandular Epithelium (Glands): Some of the epithelial cells get specialised for secretion and are called glandular epithelium.

Types of Glands

Based on cell number Based on mode of secretion

(i) **Unicellular glands:** They consist of isolated glandular cells, e.g., goblet cells (mucous cells), serous cells.

(ii) **Multicellular glands:** They consist of cluster of cells, e.g., salivary glands. These are further classified in two types: tubular and saccular glands.

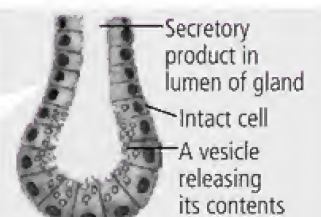
Based on site of secretion

(i) **Exocrine glands:** They are glands which drain out their secretion to the epithelial surface through ducts, e.g., gastric glands, mucous glands, intestinal glands, salivary glands, sweat glands, sebaceous glands and mammary glands.

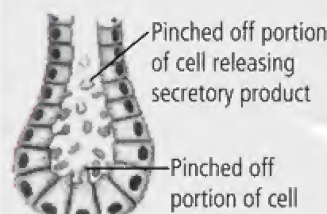
(ii) **Endocrine glands:** They are glands which pour their secretion directly into blood vascular system. Endocrine glands are commonly called ductless glands as they lack draining ducts, e.g., thyroid, adrenal, pituitary, etc.

(iii) **Heterocrine glands:** They have both exocrine part and endocrine part. The exocrine part sends its secretion by way of a duct whereas the endocrine part releases its secretion directly into blood and lymph, e.g., pancreas and gonads.

(i) **Merocrine glands:** Discharge the secretion by simple diffusion from the cell without any loss or damage to cell part, e.g., sweat gland and intestinal gland.



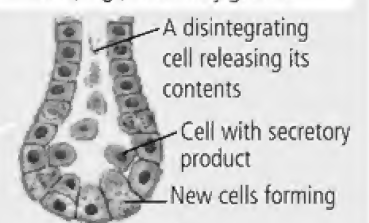
Merocrine gland



Apocrine gland

(ii) **Apocrine glands:** Glands accumulate their secretory product in the apical part of the cell. This portion of the cell breaks off from the rest of the cell and is released as secretion, e.g., mammary glands.

(iii) **Holocrine glands:** An entire cell gets filled with secretory products, disintegrates and gets discharged as secretion, e.g., sebaceous glands.



Holocrine gland

Functions of Epithelial Tissues

Protection Formation of exoskeleton Secretion and absorption Excretion Exchange of gases Sensation Conduction of fluids

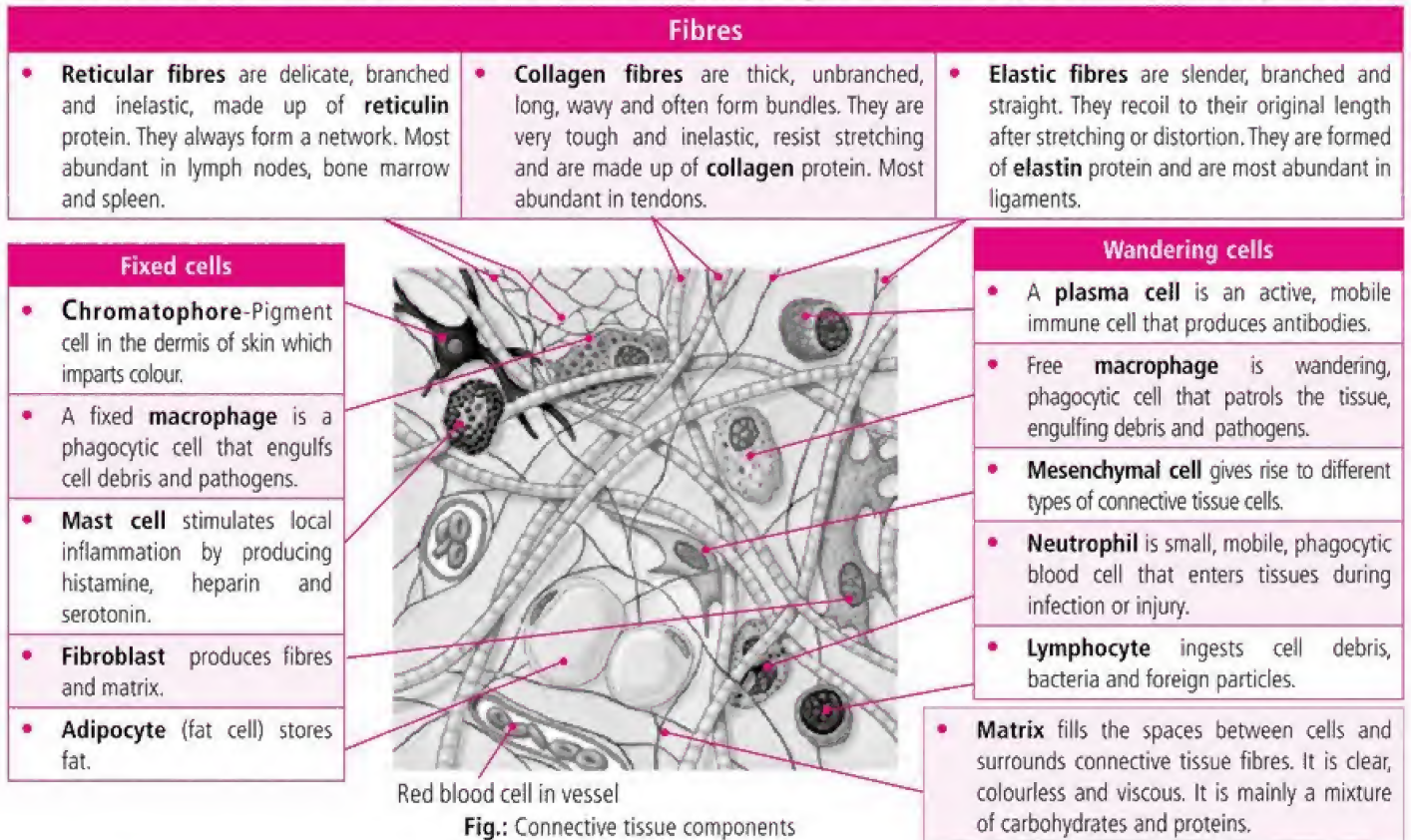
CONNECTIVE TISSUE

It is formed from mesoderm of the embryo and is the most abundant and widely distributed tissue of the body.

This tissue provides the structural framework and support to different tissues and helps in body defence, repair, fat storage, etc.

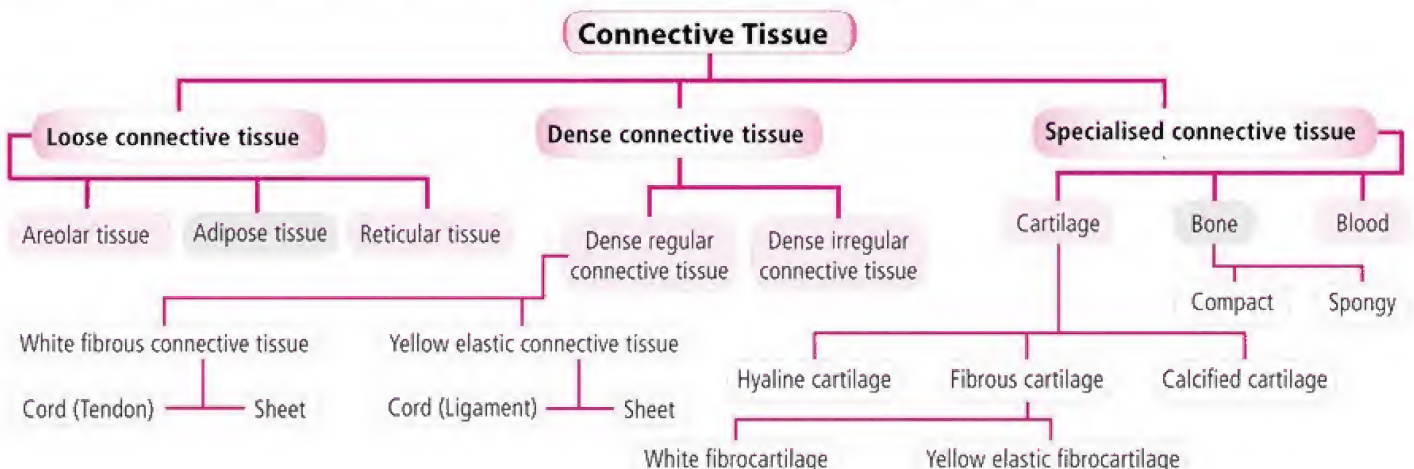
Components of Connective Tissues

There are three components present in the connective tissue, namely, **matrix** (ground substance), **cells** (fixed and wandering) and **fibres**.



Types of Connective Tissue

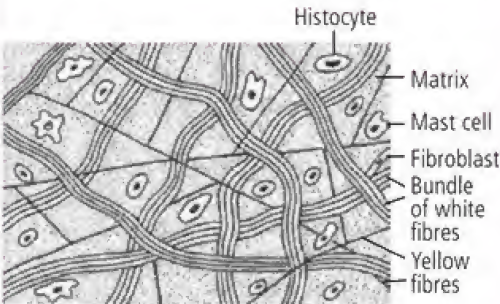
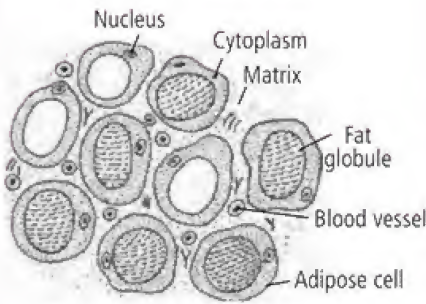
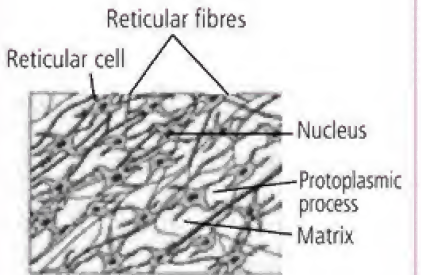
Connective tissue can be classified into three types as shown in the flow chart given below:



Loose Connective Tissue

It has loosely arranged cells in a semi-fluid ground substance.

Table: Types of loose connective tissue

	Areolar tissue	Adipose tissue	Reticular tissue
Structure	It takes the form of fine threads crossing each other in every direction leaving small spaces called areolae . It consists of ground substance, matrix , white and yellow fibres and cells like fibroblasts, mast cells, macrophages, lymphocytes, plasma cells, mesenchyme cells, chromatophores. Fat cells can be seen in small groups.	It is a fat storing connective tissue. This tissue consists of several spherical or oval adipose cells . Each adipose cell contains fat globules, due to which the nucleus and the cytoplasm are displaced to the periphery. These cells are often called signet ring cells .	This tissue consists of star-shaped reticular cells whose protoplasmic processes join to form a cellular network. The reticular fibres are present on the reticular cells. They are composed of a protein called reticulin . Matrix and some other cells such as macrophages, lymphocytes and adipose cells are also present.
Location	Most widely distributed connective tissue in the body. It is present under the skin as subcutaneous tissue in between and around muscles, nerves and blood vessels in submucosa of gastrointestinal tract, respiratory tract, bone marrow.	Found in the subcutaneous tissue , around the heart, kidneys, eyeballs, mesenteries and omenta, where fat is stored. It is found in blubber of whale and elephant seal, hump of camel, fat bodies of frog.	Liver, spleen, lymph nodes, thymus, tonsils, bone marrow and lamina propria of the gut wall.
Function	Binding parts together , provides strength, elasticity, support to the parts where this tissue is present. It also provides rapid diffusion of materials and migration of wandering cells towards areas of infection and repair.	It is chiefly a food reserve or ' fat depot ' for storage. The subcutaneous fat prevents heat loss from the body, forms a shock-absorbing cushion around the eye balls and kidneys.	Provides strength and support and forms the supporting framework (stroma) of many organs. It also helps to bind together the cells of smooth muscles. The reticular cells are phagocytic and form defence mechanism of the body.
Diagrammatic representation			

Dense Connective Tissue

This tissue contains tightly packed collagen fibres, making it stronger than loose connective tissue. It is of two types : dense irregular connective tissue and dense regular connective tissue.

(i) **Dense irregular tissue** consists of fibroblasts and many fibres (mostly collagen) that are oriented differently. This type of connective tissue produces **tough coverings that package organs**, such as capsules of kidneys and adrenal glands. It also covers muscle as epimysium, nerves as perineurium and bones as periosteum.

(ii) **Dense regular connective tissue** has **collagen fibres** present in rows between many parallel bundles of fibres. It is of two types as discussed in the table on next page:

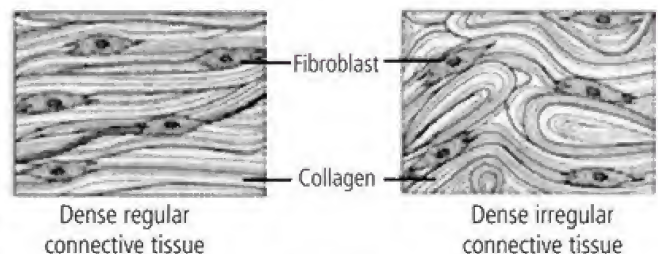


Fig.: Types of dense connective tissue

Table: Types of dense regular connective tissue

		White fibrous connective tissue	Yellow elastic connective tissue
Types	Structure	It consists of mainly white (collagen) fibres which are arranged in bundles. The fibroblasts are present in rows between the bundles.	This tissue is mainly made up of much thicker branched loose network of yellow elastic fibres . The fibroblasts are irregularly scattered.
	Cords	It forms cords called tendons , which connect the skeletal muscles with the bones.	This tissue forms cords called ligaments which join bones to bones.
Types	Sheets	It forms flat plates or sheets which occur in the dermis of the skin, connective tissue sheaths of muscles and nerves and tunica adventitia of large blood vessel, periosteum, perichondrium, pericardium, duramater and renal capsule, etc.	The sheets formed by this tissue occur in the walls of blood vessels, lungs, bronchioles, true vocal cords, cartilage of larynx and trachea.
	Function	It has great strength, however its flexibility is limited . The presence of white fibrous tissue at the joints between skull bones makes them immovable.	This tissue has considerable strength and remarkable elasticity . Thus, it allows stretching of various organs.

Specialised Connective Tissue

This tissue includes cartilage, bone and blood; each having unique cells and extracellular matrices that allow special functions.

Cartilage

It is a soft skeletal tissue, not rigid like bone. It is found more abundantly in vertebrate embryos because most of the bones forming skeleton of the adult are cartilaginous in the early stage. A typical cartilage consists of cartilage cells and ground substance (matrix).

- Cartilage cells or chondrocytes** : They are present in a fluid-filled space, called lacunae. Young cartilage cells **chondroblasts** are small and flattened whereas mature cartilage cells **chondrocytes** are large and rounded. Chondroblasts are metabolically more active cells than chondrocytes.
- Ground substance (matrix)** : It essentially consists of water, proteoglycans, some lipid, collagen, non-collagenous protein and collagen fibres. The core protein is known as **aggrecan**. Carbohydrates are glucosaminoglycans (GAG) including chondroitin sulphate, keratin sulphate and hyaluronic acid.

The cartilage is divided into three types as shown in the table below.

Table : Types of cartilage

	Hyaline cartilage	Fibrous cartilage	Calcified cartilage
Structure	It contains clear, large amount of translucent, slightly elastic matrix with less fibres. It is the most prevalent cartilage.	It is of two types: White fibrous cartilage (strongest cartilage) and yellow elastic cartilage (makes cartilage flexible).	The matrix contains granules of calcium carbonate, which makes cartilage hard and elastic.
Location	Forms the articular surfaces at the joints of long bones such as knees, where it is called articular cartilage . It also forms part of larynx and sternum (breast bone), rings of trachea and bronchi, sternal parts of ribs (= costal cartilages), hyoid apparatus and nasal cartilages.	White fibrocartilage occurs in the intervertebral disc and in the pubic symphysis. Yellow elastic cartilage occurs in pinna, external auditory canal, epiglottis, etc.	It is found in supra scapula of pectoral girdle of frog, and vertebrae of shark.

Bone

Bone is a solid, rigid and strong connective tissue which gives support to various organs. A bone which has been exposed to drying conditions for a long time so that all living cells die, decay and disappear is called **dried bone**. This bone then contains only inorganic matrix.

When a bone is kept in dilute acid (HCl or HNO₃) for long hours due to which calcium, magnesium, potassium and sodium salts of inorganic part of matrix get dissolved whereas organic part of matrix remains intact is known as **decalcified bone**.

Structure of mammalian bone

Mammalian bone consists of four parts :

- (i) **Periosteum** : It is a thick and tough sheath of collagen that forms an envelop around the bone. Bundles of periosteal collagen fibres, called **Sharpey's fibres**, penetrate the bone matrix to provide a firm connection between the two. **The periosteum contains blood vessels and bone-forming cells**, which produce new bone material.

Types of bone cells

Osteoblasts : Secrete collagen fibres and matrix (ground substance) of bone and are responsible for the calcification of the matrix. They retain the ability to divide and communicate by thin cytoplasmic processes which form gap junctions.

Osteocytes : When an osteoblast is completely surrounded by the matrix, it is called an **osteocyte**. These are inactive bone cells or bone forming cells. They are responsible for maintaining the matrix and can both secrete and resorb matrix.

Osteoclasts : Formed by fusion of monocytes, destroy bone matrix. They release lysosomes, organic acids and hydrolytic enzymes to break down, the bone matrix.

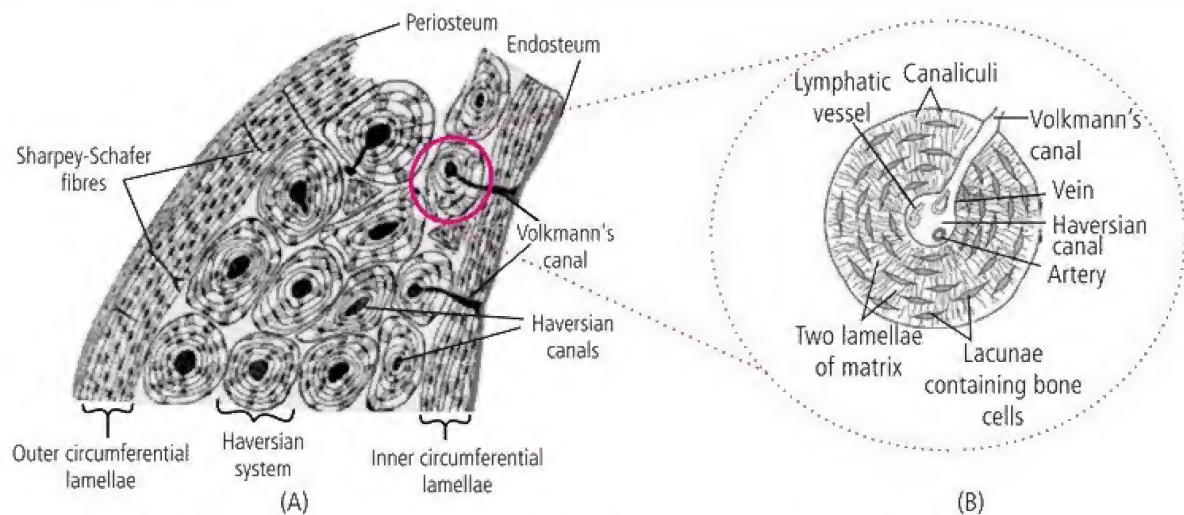


Fig.: (A) T.S. of mammalian bone; (B) Magnified view of bone showing Haversian and Volkmann's canal

- (ii) **Matrix** : It is tough, containing both inorganic and organic substances. It consists of **ossein protein** and mineralisation occurs by **calcium phosphate salts**. The **Haversian canal**, a **characteristic feature of the mammalian bones**, is present in the matrix. It contains an artery, a vein, a lymph vessel, a nerve, and some bone cells packed in connective tissue. These canals are interconnected by transverse channels called **Volkmann's canals**. The matrix of the bone are present as layers called **lamellae**. The lamellae are of four types: Haversian lamellae, interstitial lamellae, outer and inner circumferential lamellae.
- (iii) **Endosteum** : It is present outer to the bone marrow cavity and comprises of white fibrous tissue and osteoblasts. **Because of the presence of osteoblasts in both periosteum and endosteum, bone can grow both from outside and inside, i.e., growth of bone is bidirectional.**
- (iv) **Bone marrow** : In long bones, a cavity is present inner to endosteum called as **bone marrow cavity** which is filled with a soft neurovascular connective tissue (areolar, adipose and blood vascular) called bone marrow. Bone marrow is of two types:

Types of bone marrow

Red bone marrow

- Red coloured (due to erythrocytes), active vascular tissue in the long bone.
- Few fat cells are present.
- Produces blood corpuscles and platelets.
- During fetal life and at birth it occurs throughout the skeleton.

Yellow bone marrow

- Yellow coloured (due to predominance of adipocytes), inactive vascular tissue in the long bones.
- More fat cells are found.
- Produces blood corpuscles only in emergency, i.e., excessive blood loss.
- With age, yellow bone marrow gradually replaces red bone marrow in the long bones.

Types of bones

On the basis of texture, a bone is of two types : compact and spongy (cancellate) bone.

Table : Types of bones

Characteristics	Compact bone	Spongy bone
Location	In the shaft (diaphysis) of long bones	In the epiphyses of long bones
Lamellae	Arranged to form Haversian system	Arranged irregularly, lamellae form trabeculae
Bone marrow	Yellow; stores fat	Red; produces RBCs
Bone marrow cavity	Narrow	Broad
Nature	Hard and compact	Spongy


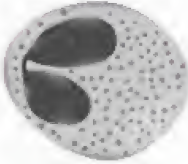
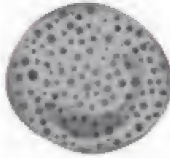
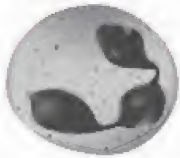
Blood




Blood is a **mobile, fluid** and softest **connective tissue** which is mesodermal in origin. It is of reddish colour that flows inside blood vessels by means of pumping activity of heart. **An adult human contains 5.0 – 5.5 litres of blood.** Blood is composed of a watery fluid called **plasma** and **formed elements** (blood corpuscles).

Plasma is a complex liquid component of the blood, about 90% of which is formed by the water alone. Several organic and inorganic substances including proteins, glucose, cholesterol, urea, hormones, vitamins, inorganic salts and fibrinogen are dissolved in the plasma. It also contains an anticoagulant, **heparin**.

Formed elements or blood corpuscles are of the three types : erythrocytes, leucocytes and thrombocytes (platelets).

Table : Types of blood cells

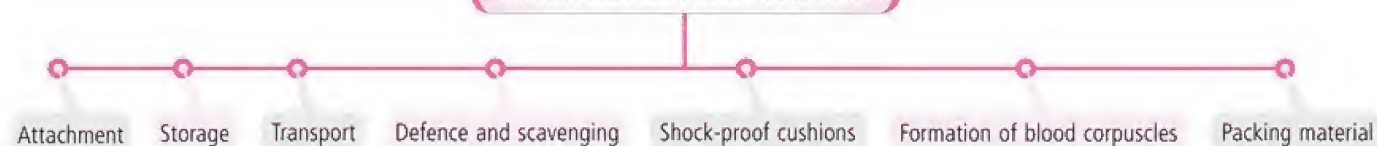
Blood cell		Description
1. Erythrocyte (Red blood corpuscle) 		<ul style="list-style-type: none">– It is circular, biconcave, denucleated, has homogenous cytoplasm with haemoglobin.– Cell organelles such as endoplasmic reticulum, mitochondria, ribosomes, centrioles are absent.– It transports oxygen and some amount of carbon dioxide.– Formation of erythrocytes is called erythropoiesis.– Excess RBCs are stored in the spleen.– Life span of RBC is about 120 days.
2. Leucocytes (White blood corpuscles)		
Granulocytes	Eosinophil 	<ul style="list-style-type: none">– It has bilobed nucleus and has coarse granules in cytoplasm. It takes acidic stain.– It is non-phagocytic in nature, has antiallergic properties and plays role in immunity.– It also helps in dissolving blood clot.– It can attach itself to parasitic forms, causes their destruction by liberating lysosomal enzymes on their surface.
	Basophil 	<ul style="list-style-type: none">– The nucleus is usually three lobed, there are less number of coarse granules in cytoplasm. It takes basic stain.– It releases heparin, histamine and serotonin.– It is similar to mast cells of connective tissues.
	Neutrophil 	<ul style="list-style-type: none">– It has many lobed nucleus, fine granules in cytoplasm and it takes acidic as well as basic stains.– It is phagocytic in nature. It engulfs germs and dead cells.– Barr bodies are found.

Agranulocytes	Lymphocyte 	<ul style="list-style-type: none"> It has a large rounded nucleus and its cytoplasm lacks granules. It is motile, non-phagocytic and produces antibodies; helps in healing. It is responsible for immune responses. It is of two main types : B cells and T cells.
	Monocyte 	<ul style="list-style-type: none"> It is the largest of all types of leucocytes. It is somewhat amoeboid in shape. Nucleus is bean shaped, has enough cytoplasm. It is motile, phagocytic in nature, <i>i.e.</i>, engulfs germs and cell debris, often changes into macrophages. This can change into macrophages after entering tissue spaces.
3. Thrombocytes (Platelets) 		<ul style="list-style-type: none"> They are colourless, rounded or oval, non-nucleated fragments of the cells. They help in blood clotting by promoting blood clotting mechanisms. These are formed in the bone marrow.

Lymph

It is a mobile connective tissue made up of plasma and lymph corpuscles. Lymph plasma is similar to that of blood but has fewer blood proteins, less calcium and phosphorus and high glucose concentration. Main proteins are **globulins** which are actually antibodies. Lymph corpuscles are floating amoeboid cells, mostly lymphocyte. **RBCs and platelets are absent in lymph.**

Functions of Connective Tissue



POWER EXERCISE

New MCQs

1. Match the column I with column II and select the correct option.

Column I Type of leucocyte	Column II Shape of nucleus
A. Lymphocytes	(i) Two lobed nucleus
B. Monocytes	(ii) Three lobed nucleus
C. Eosinophils	(iii) Many lobed nucleus
D. Basophils	(iv) Large rounded nucleus
E. Neutrophils	(v) Bean-shaped nucleus
(a) A-(iv); B-(v); C-(ii); D-(i); E-(iii)	
(b) A-(v); B-(ii); C-(v); D-(iii); E-(i)	
(c) A-(iv); B-(v); C-(i); D-(ii); E-(iii)	
(d) A-(v); B-(iv); C-(iii); D-(i); E-(ii)	

2. An example of holocrine glands is
 (a) mammary glands (b) sebaceous glands
 (c) salivary glands (d) goblet cells.
3. A epithelium is present in the alveoli of lungs, B epithelium is present in pancreatic ducts, C epithelium is present in bile duct.
- | A | B | C |
|---------------------|-----------------|-----------------|
| (a) Simple cuboidal | Simple squamous | Simple columnar |
| (b) Simple columnar | Simple cuboidal | Simple squamous |
| (c) Simple squamous | Simple cuboidal | Simple columnar |
| (d) Simple squamous | Simple columnar | Simple cuboidal |
4. Type of junctions which have intercellular proteins are
 (a) tight junctions (b) gap junctions
 (c) interdigitations (d) desmosomes.
5. Which of the following statements about spongy bone is incorrect?

- (a) Marrow cavity has yellow marrow.
- (b) It is found at the epiphysis of long bones.
- (c) Lamellae are arranged as interlacing network.
- (d) It produces erythrocytes and granular leucocytes.

6. Select the correct statements about transitional epithelium.

- (i) It is always ciliated.
- (ii) It is a compound epithelium.
- (iii) It is capable of stretching.
- (iv) It has a basement membrane.
- (a) (i) and (iii) (b) (ii) and (iii)
- (c) (i), (iii) and (iv) (d) (i), (ii) and (iii)

7. Match the column I with column II and select the correct option.

Column I

Type of bone

- A. Sesamoid bones
- B. Membrane bones
- C. Replacing bones
- D. Visceral bones
- (a) A-(iv); B-(iii); C-(i); D-(ii)
- (b) A-(ii); B-(iii); C-(iv); D-(i)
- (c) A-(iii); B-(ii); C-(iv); D-(i)
- (d) A-(ii); B-(iii); C-(i); D-(iv)

Column II

Example

- (i) os penis in bats
- (ii) Knee-cap
- (iii) Parietals of the skull
- (iv) Humerus

8. Identify the correct statement among the following.

- (a) The concentration of glucose is higher in blood as compared to lymph.
- (b) Reticular connective tissue forms defence mechanism of the body.
- (c) Eosinophils are the most numerous of all leucocytes present in body.
- (d) White fibrous connective tissue consists of mainly actin fibers.

9. Wharton's jelly, a jelly like substance is the most conspicuous component of

- (a) pigmented connective tissue
- (b) mucoid connective tissue
- (c) reticular connective tissue
- (d) areolar connective tissue.

10. Excess of red blood corpuscles are stored in the

- (a) liver (b) pancreas
- (c) spleen (d) thymus.

- (a) D-Unicellular glandular epithelium, goblet cells, secrete saliva
- (b) B-Squamous epithelium, walls of blood vessels, form a diffusion boundary
- (c) A-Cuboidal epithelium, ducts of glands, secretion and absorption
- (d) C-Columnar epithelium, lining of stomach, secretion and absorption (AIIMS 2017)

2. Which type of tissue correctly matches with its location?

Tissue	Location
(a) Transitional epithelium	Tip of nose
(b) Cuboidal epithelium	Lining of stomach
(c) Smooth muscle	Wall of intestine
(d) Areolar tissue	Tendons

(NEET Phase-I 2016)

3. **Assertion :** Gap junctions perform cementing function to keep the neighbouring cells together.

Reason : Tight junctions facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells, for rapid transfer of ions, small and big molecules, etc.

- (a) If both assertion and reason are true and reason is the correct explanation of assertion.
- (b) If both assertion and reason are true but reason is not the correct explanation of assertion.
- (c) If assertion is true but reason is false.
- (d) If both assertion and reason are false. (AIIMS 2016)

4. Most of the cartilages in vertebrate embryo are replaced in adult by

- (a) blood (b) bones
- (c) tendons (d) ligaments
- (e) muscle. (Kerala PMT 2015)

5. Osteoid refers to

- (a) the smallest bone of the body
- (b) young hyaline matrix of true bone in which calcium salts are deposited
- (c) membranous ossification of cranium
- (d) the largest bone of the body. (WB JEE 2015)

6. Choose the correctly matched pair.

- (a) Inner lining of salivary ducts - Ciliated epithelium
- (b) Moist surface of buccal cavity - Glandular epithelium
- (c) Tubular parts of nephrons - Cuboidal epithelium
- (d) Inner surface of bronchioles - Squamous epithelium (AIPMT 2014)

7. Read the following statements and choose the correct answer.

ANSWERS

WHO AM I ...

- | | |
|----------------------|--------|
| 1. Drupe | Pg. 16 |
| 2. Partial regulator | Pg. 62 |
| 3. Juglone | Pg. 64 |

Exam Section

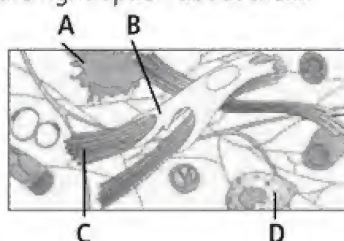
1. The figure shows different human tissues labelled as A to D. Which option gives the correct identification of the label, its location and one feature?



- I. Gap junctions cement adjacent cells together.
 - II. Areolar tissue contains fibroblasts, macrophages and mast cells.
 - III. Tight junctions facilitate the cells to communicate with each other.
 - IV. Adhering junctions help to stop substances from leaking across tissues.
 - V. Cells of connective tissue except blood secrete fibres of structural proteins called elastin.
- (a) I, II and III only are wrong
 - (b) I, III and IV only are wrong
 - (c) III and V only are wrong
 - (d) I, II and V only are wrong
 - (e) II, IV and V only are wrong

(Kerala PMT 2014)

8. Given below is the diagrammatic sketch of a certain type of connective tissue. Identify the parts labelled A, B, C and D, and select the right option about them.



- | | A | B | C | D |
|-----|------------|-----------------|-----------------|-----------------|
| (a) | Macrophage | Fibroblast | Collagen fibres | Mast cells |
| (b) | Mast cell | Macrophage | Fibroblast | Collagen fibres |
| (c) | Macrophage | Collagen fibres | Fibroblast | Mast cell |
| (d) | Mast cell | Collagen fibres | Fibroblast | Macrophage |

(AIPMT Mains 2012)

9. The cells lining the blood vessels belong to the category of
- (a) smooth muscle tissue
 - (b) squamous epithelium
 - (c) columnar epithelium
 - (d) connective tissue.

(AIPMT Mains 2011)

10. Mast cells of connective tissue contain
- (a) vasopressin and relaxin
 - (b) heparin and histamine
 - (c) heparin and calcitonin
 - (d) serotonin and melanin.

(BHU 2010)

Assertion & Reason

The following questions consist of two statements each : assertion (A) and reason (R). To answer these questions, mark the correct alternative as directed below :

- (a) If both A and R are true and R is the correct explanation of A.
- (b) If both A and R are true but R is not the correct explanation of A.
- (c) If A is true but R is false.
- (d) If both A and R are false.

1. **Assertion** : Urinary bladder can considerably expand to accommodate urine.

Reason : Urinary bladder is lined by stretchable squamous epithelium.

2. **Assertion** : Simple cuboidal epithelium of ovaries and seminiferous tubules is known as germinal epithelium.

Reason : Germinal epithelium produces gametes.

3. **Assertion** : Bones possess longitudinal canals called lacunae.

Reason : Lacunae carry blood vessels and nerves to the bones.

4. **Assertion** : Epithelial tissues protect the underlying tissues.

Reason : Materials are exchanged at the surfaces across the epithelial tissues.

5. **Assertion** : Cartilage cells receive their nutrition by diffusion from the perichondrium.

Reason : The perichondrium contains blood vessels.

Short Answer Type Questions

1. Fill in the blanks.
 - (i) The increase in number of acidophils during allergy is called _____.
 - (ii) _____ cartilage is present in the supra scapula of pectoral girdle of frog.
 - (iii) Urothelium is another term for _____ epithelium.
2. Write a short note on haemopoiesis.
3. What is lymph? Discuss its composition.
4. Define the followings:
 - (a) Diapedesis
 - (b) Endoneurium
 - (c) Desmosomes

ANSWER KEY

New MCQs

- | | | | | |
|--------|--------|--------|--------|---------|
| 1. (c) | 2. (b) | 3. (c) | 4. (b) | 5. (a) |
| 6. (b) | 7. (d) | 8. (b) | 9. (b) | 10. (c) |

Exam Section

- | | | | | |
|--------|--------|--------|--------|---------|
| 1. (d) | 2. (c) | 3. (d) | 4. (b) | 5. (b) |
| 6. (c) | 7. (b) | 8. (a) | 9. (b) | 10. (b) |

Assertion & Reason

- | | | | | |
|--------|--------|--------|--------|--------|
| 1. (c) | 2. (a) | 3. (d) | 4. (b) | 5. (a) |
|--------|--------|--------|--------|--------|

Short Answer Type Questions

1. (i) eosinophilia, (ii) Calcified, (iii) transitional
2. The process of formation of blood is called haemopoiesis. In mammals, this process takes place in yolk sac, liver, bone marrow, lymph nodes, spleen and thymus. In adults, most

CONCEPT MAP

VEGETATIVE PROPAGATION IN PLANTS

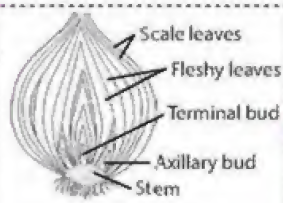
Vegetative propagation is the regeneration of new plants from vegetative parts of parent plant. It includes all those processes of propagation in which a part of the plant body is separated from the parent plant and gives rise to a new individual without any obvious changes in the protoplast. All the plants developed by vegetative propagation are genetically identical to their parent plants.

NATURAL METHODS

Propagation by Stem

Bulb

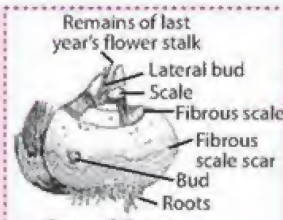
Short and thickened underground stem axis represented by a slightly conical disc with fleshy leaves surrounding a terminal bud at the centre of disc. Onion, tulip, garlic, etc., commonly propagate by bulb.



Bulb (L.S.) of onion

Corm

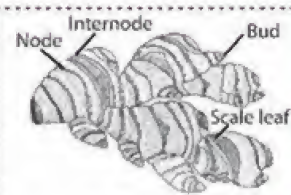
Condensed form of rhizome which grows vertically down. Internodes are usually reduced and one or more axillary buds are present in the axil of scale leaves. *Colocasia*, *Gladiolus*, *Crocus*, etc., propagate through corm.



Corm of Crocus

Rhizome

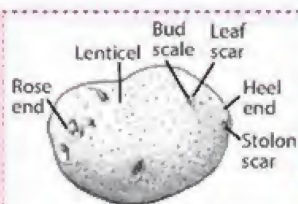
They are thick, prostrate and branched stems which grow horizontally. Distinct nodes and internodes are present. Nodes bear small scale leaves with buds. Ginger, turmeric, *Canna*, etc., propagate by means of rhizomes.



Rhizome of ginger

Tuber

It is an underground stem modification for reserve food accumulation. Eyes or axillary buds are present on the surface which give rise to new plantlets. Potato, *Caladium*, etc., commonly propagate by tuber.

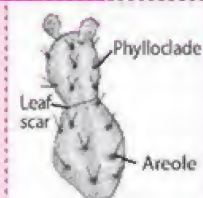


Tuber of potato

Underground stem

Aerial stem

Phylloclades are fleshy, green, flattened or cylindrical stem branches. Each segment of stem can form a new plant on breaking off, e.g., *Opuntia*.



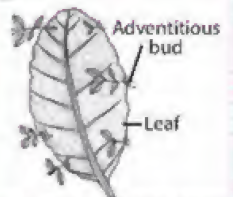
Phylloclade of *Opuntia*

Subaerial stem

Some subaerial stem modifications also take part in vegetative propagation. **Runner** is a slender creeping stem with long internodes. Nodes bear axillary buds, scale leaves and adventitious roots. Runners break off and grow into individual plants, e.g., *Oxalis*, *Cynodon*, etc. **Stolons** are arched horizontal branches which develop into new plants where they touch the ground, e.g., strawberry. **Offset** is a short runner that is one internode long, generally found in aquatic plants, e.g., *Eichhornia*. **Suckers** are slender subaerial branches which develop from base of aerial shoot. Initially they grow horizontally but soon grow obliquely upwards forming a leafy shoot, e.g., mint.

Propagation by Leaf

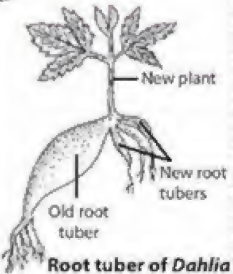
Foliar buds are produced on leaf margins of many plants which can grow into new plants. When such leaves fall on the ground the buds germinate and give rise to new plants, e.g., *Bryophyllum*, *Kalanchoe*, etc.



Foliar buds in *Bryophyllum*

Propagation by Root

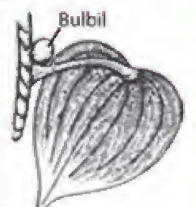
Tap roots of some plants develop adventitious buds to form new plants, e.g., *Dalbergia*. In some plants like sweet potato and *Dahlia*, root tubers develop adventitious buds which develop into new plant.



Root tuber of *Dahlia*

Propagation by Bulbil

In *Globba bulbifera*, some flowers in the lower part of the inflorescence are modified into small multicellular structures, called **bulbils**. They fall on the ground and grow into new plants. In American aloe, (*Agave sisalana*), reproductive buds (bulbils) often take the place of many flowers on the inflorescence axis. Bulbils are also produced in the leaf axil of wild yam (*Dioscorea bulbifera*) and *Lilium bulbiferum*.



Bulbil of *Dioscorea bulbifera*

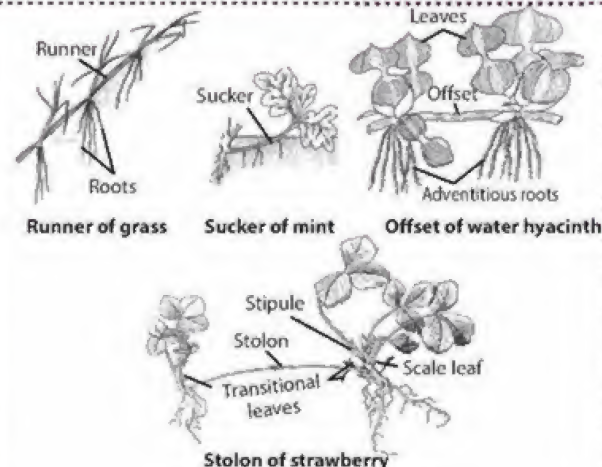


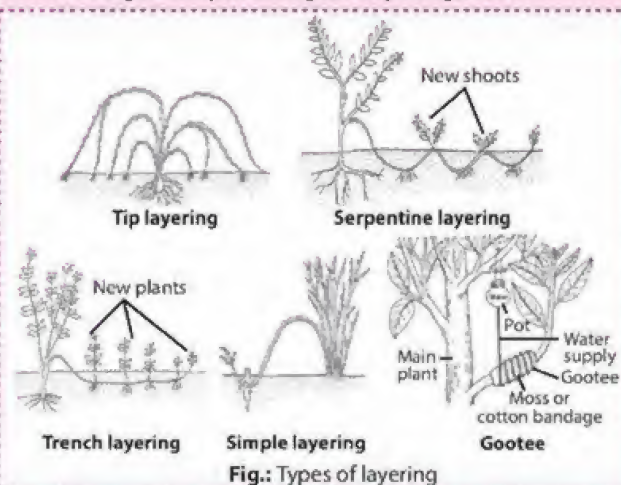
Fig.: Types of subaerial stem

ARTIFICIAL METHODS

Layering

It is the method of inducing root formation in stem while it is still attached to the parent plant. It is of following types:

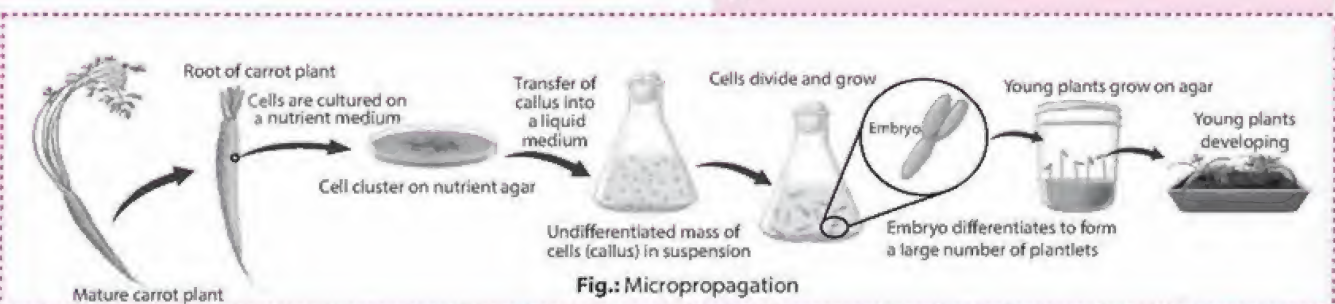
- Tip layering**: In this method, tip portion of the shoot is bent and buried in the soil. *E.g.*, black raspberry.
- Serpentine layering**: In this method, long slender shoot is bent and laid to the ground, covered with soil at short regular intervals so as to form many plants. *E.g.*, *Clematis*.
- Trench layering**: In this method, long shoot is placed in trench leaving the apical portion exposed. Roots are produced at each node on the lower side and shoot emerges on the upper side. *E.g.*, walnut, mulberry.
- Simple layering**: In this method, rooting is induced on a soft stem. It is defoliated and a small injury is made on it. After that it is pegged in the soil to develop adventitious roots. Later on, the layer is separated and planted. *E.g.*, jasmine, grapevine.
- Air layering or gootee**: In this method, rooting is induced in aerial hard branches. The stem is girdled and covered with moist moss or cotton. Water is added to it along with small quantity of root promoting hormones. After 2-3 months roots appear and shoot is then cut below the cotton bandage and replanted. *E.g.*, litchi, pomegranate.



Cutting

Any part of the plant (stem, root or leaf) that produces roots when put into the soil and gives rise to a new plant is called cutting. It can be done in following ways:

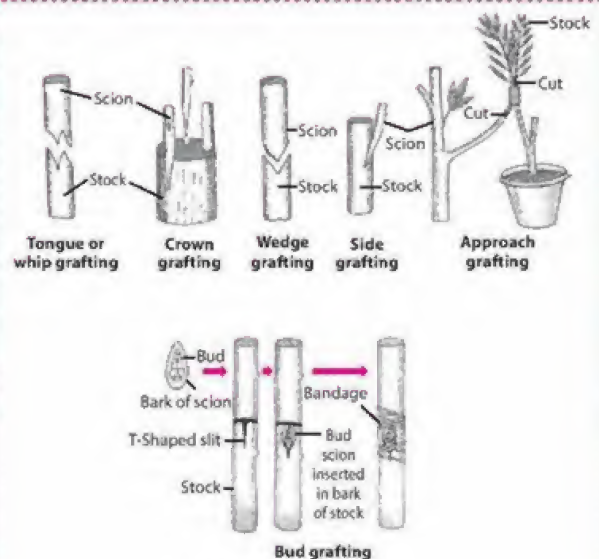
- Root cutting**: The pieces of roots are used to artificially propagate new plants, *e.g.*, lemon, orange, etc.
- Stem cutting**: 20-30 cm long stem cuttings are used to propagate both herbaceous and woody plants. Their lower ends are dipped in root promoting hormones for several minutes before planting, *e.g.*, rose.
- Leaf cutting**: In this technique, leaf is transversely cut into two or three parts and leaf cuttings are vertically planted in soil, *e.g.*, *Sansevieria*.



Grafting

Grafting is the technique of joining together parts of two different plants in such a manner that they unite and later develop as a composite plant. Various techniques of grafting are as follows:

- Tongue grafting**: Oblique cut is given to both stock and scion (of same diameter) and they are tied together.
- Crown grafting**: Stock has larger diameter than scion. Many slits are formed on the sides of stock and scions are inserted into them and bandaged.
- Wedge grafting**: V-shaped notch is given to stock and wedge like cut is given to scion (both of same diameter).
- Side grafting**: V-shaped notch is given to stock at one side and scion is inserted in it. Stock has larger diameter than scion.
- Approach grafting**: Two independently growing plants are brought together. Their shoots are given cuts at the same level and united.
- Bud grafting**: In bud grafting, scion consists of a single bud accompanied with a portion of living tissue. It is inserted into a T-shaped incision on the stock treated with grafting wax and bandaged, *e.g.*, apple, peach.



Micropropagation

The technique of propagating plants by culturing cells, tissues and organs is known as micropropagation. It is popularly known as **tissue culture**. Methods of micropropagation are callus culture, suspension culture, embryo culture, anther culture, protoplast culture, etc. Laboratory culturing ultimately results in formation of large number of plantlets, *e.g.*, orchids, Carnation, etc.

of the blood corpuscles are formed in the red bone marrow of long bones. Lymphocytes are formed in thymus, spleen, lymph nodes, tonsils and Peyer's patches.

3. Lymph is a mobile connective tissue comprising lymph plasma and lymph corpuscles.

Lymph plasma : It is similar to that of blood but has fewer blood proteins, less calcium and phosphorus and high glucose concentration. Globulin proteins are present which are actually antibodies.

Lymph corpuscles : There are mostly lymphocytes. Erythrocytes and platelets are absent in lymph.

4. (a) The leucocytes can change their shape which enables

them to squeeze out of blood capillaries into the tissues. This process is called diapedesis.

- (b) Endoneurium is a layer of connective tissue which surrounds a nerve fibre.
- (c) Desmosomes are plaque-like areas which provide strong mechanical attachment between two adjacent cells with the help of adhesion molecules and filaments (tonofibrils). They have intercellular proteins. Desmosomes occur in areas where strong cohesion is required.



NORMAN BORLAUG



Norman Ernest Borlaug was an American agronomist, humanitarian and Nobel laureate who has been called "The Father of Green Revolution". He has been credited with saving millions of people from starvation in developing countries. He was born on March 25, 1914 on a

farm near Cresco, Iowa, United States. He earned his Bachelor's degree in forestry (1937), Master's degree in plant pathology (1939) and Ph.D. in plant pathology and genetics (1942) from the University of Minnesota.

Later, from 1942 to 1944, he was employed as a microbiologist at DuPont in Wilmington, Delaware. In July 1944, he moved to Mexico City to head a program as a geneticist and plant pathologist. For the next sixteen years, he worked on the problems of wheat production that were limiting wheat cultivation and developed semi-dwarf, high-yielding, disease-resistant wheat varieties by crossing Mexican disease resistant varieties with a wheat strain having Norin-10 gene. He, then produced successive generations of wheat varieties with broad and stable disease resistance, broad adaptation to growing conditions across many degrees of latitude and with exceedingly high yield potential. These wheat varieties and improved crop management practices transformed agricultural production in Mexico during the 1940s and 1950s.

Following Borlaug's success in Mexico, Indian government also requested his assistance. Then, he in collaboration with Indian scientist, M.S. Swaminathan, introduced some

high yielding varieties of wheat in India also. This led to an increase in crop production. This phase is often called "Green Revolution".

In 1964, he was appointed as the director of the International Wheat Improvement Programme at International Maize and Wheat Improvement Centre (CIMMYT). He retired officially from the position in 1979, but remained a CIMMYT senior consultant and continued to be involved in plant research on wheat, triticale, barley, maize, and high-altitude *Sorghum*. In 1981, he became a founding member of the World Cultural Council. In 1984, he began teaching and conducting research as a distinguished professor of International Agriculture at Texas A&M University. From 1994 to 2003, he served as a member of International Fertiliser Development Centre's board of directors.

As of January 2004, he had received 49 honorary degrees from as many universities in 18 countries.

He has been awarded with the Nobel Peace Prize on December 10, 1970 by the Norwegian Nobel Committee for his contributions to the green revolution. In addition, he also received the 1977, U.S. Presidential Medal of Freedom, the 2002 Public Welfare Medal from the National Academy of Sciences and the 2004 National Medal of Science.

He served on two US Presidential Commissions: World Hunger (1978-79) and Science and Technology (1990-92). On September 12, 2009, Norman Borlaug died of lymphoma at the age of 95. In recognition of his contributions, October 16, is referred to as "Norman Borlaug World Food Prize Day" in Iowa and Minnesota, and "World Food Prize Day" throughout the United States.



MPP-10

MONTHLY Practice Problems

Class XI

This specially designed column enables students to self analyse their extent of understanding of specified chapters. Give yourself four marks for correct answer and deduct one mark for wrong answer. Self check table given at the end will help you to check your readiness.

- **Locomotion and Movement**
- **Neural Control and Coordination**
- **Chemical Coordination and Integration**

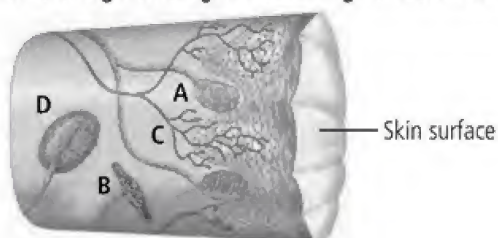
Total Marks : 160

Time Taken : 40 Min.

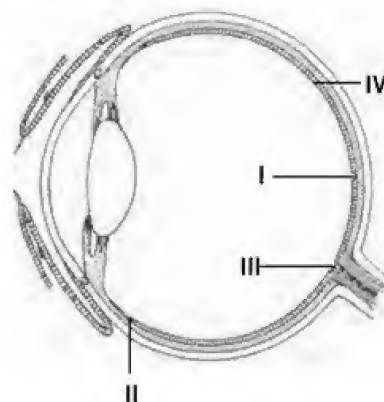
- The vertebral formula of humans is
 (a) $C_7T_{12}L_5S_{(5)}C_{(4)}$ (b) $C_{(7)}T_{12}L_4S_{(5)}C_{(5)}$
 (c) $C_5T_{10}L_8S_{(6)}C_{(4)}$ (d) $C_5T_{10}L_6S_{(8)}C_{(4)}$
- Which of the statements given below are incorrect?
 I. The first seven pairs of ribs are attached to sternum by hyaline cartilage.
 II. The tip of sternum is known as manubrium.
 III. Pubic symphysis is made up of white fibrous cartilage.
 IV. A saddle joint is monaxial joint.
 (a) I and II only (b) I, II and III only
 (c) II, III and IV only (d) II and IV only
- Match column I with column II and select the correct option.

Column I	Column II
A. Conn's syndrome	(i) Excess of parathormone
B. Gull's disease	(ii) Excess of cortisol
C. Osteoporosis	(iii) Excess of aldosterone
D. Cushing's syndrome	(iv) Deficiency of thyroid hormone

 (a) A-(iii), B-(i), C-(iv), D-(ii)
 (b) A-(iii), B-(iv), C-(i), D-(ii)
 (c) A-(iv), B-(iii), C-(ii), D-(i)
 (d) A-(iv), B-(i), C-(iii), D-(ii)
- Select the mismatched pair from the following options.
 (a) Ruffini's corpuscles – Thermoreceptors
 (b) Meissner's corpuscles – Tangoreceptors
 (c) Trochlear nerve – Longest cranial nerve
 (d) Hypoglossal nerve – Motor nerve
- Refer to the given diagram showing various skin receptors.



- The receptors which respond to strong pressure is labelled as
 (a) A (b) B (c) C (d) D.
- Modified sweat glands at the edge of the eyelids are
 (a) glands of Zeis (b) lacrimal glands
 (c) glands of Moll (d) tarsal glands.
 - Observe the given diagram of vertical section of a human eye. The area which is devoid of rods and blood vessels but has cone cells only is depicted as



- (a) I (b) II (c) III (d) IV.
- Alzheimer's disease is caused due to
 (a) destruction of neurons of the basal ganglia
 (b) destruction of neurons in the hippocampus
 (c) degeneration of the lenticular nucleus
 (d) damage to the portions of the thalamus and hypothalamus of the brain.
 - Read the given statements and select the correct option.
Statement A : Auditory function of ear is restricted only to external and middle ear.
Statement B : Internal ear bears cochlea which is responsible for maintenance of balance of the body and posture.
 (a) Both statements A and B are correct and statement B is the correct explanation of statement A.

- (b) Both statements A and B are correct but statement B is not the correct explanation of statement A.
 (c) Statement A is correct but statement B is incorrect.
 (d) Both statements A and B are incorrect.

10. Select the correct statements.

- I. Oxyphil cells of parathyroid glands secrete parathormone.
 II. Parathormone inhibits collagen synthesis by osteoblasts.
 III. A rise in blood calcium level stimulates parathyroid to secrete parathormone.
 IV. Excess of parathormone causes calcium to be deposited in the kidneys.

- (a) I and II only (b) II and III only
 (c) I and IV only (d) II and IV only

11. Presence of which hormone in urine indicates pregnancy?

- (a) Human chorionic somatomammotropin
 (b) Chorionic corticotropin
 (c) Human chorionic gonadotropin
 (d) Chorionic thyrotropin

12. Which of the following muscles is an example of rotator type of skeletal muscle?

- (a) Biceps (b) Masseter
 (c) Piriformis (d) Deltoideus

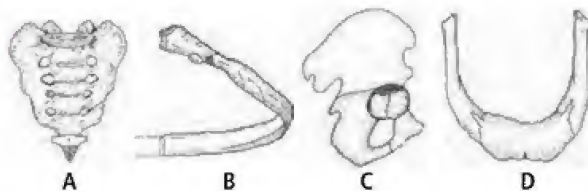
13. The events occurring during muscle contraction are given below.

- I. Thin myofilaments slide along the thick myofilaments.
 II. The calcium ions bind to troponin causing a change in its shape and position.
 III. ATP breaks down in the presence of myosin thus causing energised myosin cross bridges to bind to actin.
 IV. An action potential stimulates the sarcoplasmic reticulum to release calcium ions into the sarcoplasm.

The correct sequence of these events during muscle contraction is

- (a) IV, II, III, I (b) IV, II, I, III
 (c) II, IV, I, III (d) II, IV, III, I.

14. Refer to the given figures of different bones in human skeleton.



Which of the given bones does not articulate with any other bone?

- (a) A (b) B
 (c) C (d) D

15. Match the following columns and select the correct option from the given codes.

**Column I
(Cerebral lobe)**

- I. Occipital lobe
 II. Parietal lobe
 III. Temporal lobe
 IV. Frontal lobe

**Column II
(Function)**

- (i) Controls intellectual ability to abstract
 (ii) Decodes and interprets visual information
 (iii) Sensory perception of touch, pain, heat and cold
 (iv) Decodes and interprets sound, memory and emotion

- (a) I-(ii), II-(iii), III-(iv), IV-(i)
 (b) I-(iii), II-(ii), III-(iv), IV-(i)
 (c) I-(iv), II-(iii), III-(ii), IV-(i)
 (d) I-(iii), II-(ii), III-(i), IV-(iv)

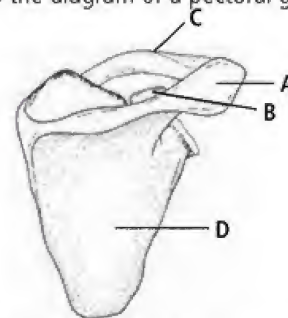
16. A hormone secreted by the intermediate lobe of pituitary gland is

- (a) thyrotropin (b) luteinising hormone
 (c) melanotrophin (d) vasopressin.

17. Read the following statements carefully and choose the correct option.

- (i) In green-stick fracture, bone breaks completely into two parts which remain close to each other.
 (ii) Acetylcholinesterase breaks down acetylcholine into acetate and choline and terminates the action of the transmitter.
 (iii) GABA is released by synaptic knobs of the fibres of some interneurons in CNS.
 (iv) Isthmus is the connecting structure between two lobes of hypothalamus.
 (a) (i) and (ii) are correct. (b) (iii) and (iv) are correct.
 (c) (i) and (iv) are incorrect.
 (d) (ii) and (iv) are incorrect.

18. Refer to the diagram of a pectoral girdle as shown below.



The tendons of the muscles attach to the pectoral girdle at

- (a) A (b) B
 (c) C (d) D.

19. Identify the correct statement regarding hypothalamus.

- (a) It relays impulses back and forth between the cerebrum, cerebellum, pons and medulla.
 (b) Pneumotaxic centre is present in hypothalamus.
 (c) It is thermoregulatory centre.
 (d) It controls emotional behaviour expressed in the form of joy, sorrow, fear, fight.

20. An immunosuppressive hormone is
 (a) aldosterone (b) vasopressin
 (c) cortisol (d) Collip's hormone.
21. Which of the following statements is true regarding vitreous humour present in eye?
 (a) It is present between cornea and lens.
 (b) It is a semisolid jelly-like substance.
 (c) It can be continuously replaced in a significant quantity.
 (d) It provides nutrients to the lens and cornea.

22. Read the given statements and select the correct option.
Statement A : Nerve impulse is originated from threshold stimulus.

Statement B : Threshold stimulus is the minimum strength of stimulus which is applied to the nerve fibre to stimulate it effectively.

- (a) Both statements A and B are correct and statement B is the correct explanation of statement A.
 (b) Both statements A and B are correct but statement B is not the correct explanation of statement A.
 (c) Statement A is correct but statement B is incorrect.
 (d) Both statements A and B are incorrect.

23. Fourth cranial nerve in humans is

- (a) trochlear nerve
 (b) optic nerve
 (c) facial nerve
 (d) glossopharyngeal nerve.

24. Which of the following functions of parasympathetic neural system is given incorrectly?

- (a) It slows heartbeat.
 (b) It promotes contraction of gall bladder.
 (c) It relaxes urinary bladder.
 (d) It constricts pupil of eye.

25. Read the given passage.

The electrical potential difference across the resting plasma membrane is called as the A whereas the state of the resting membrane is called B.

Select the option which correctly fills the given blanks.

A

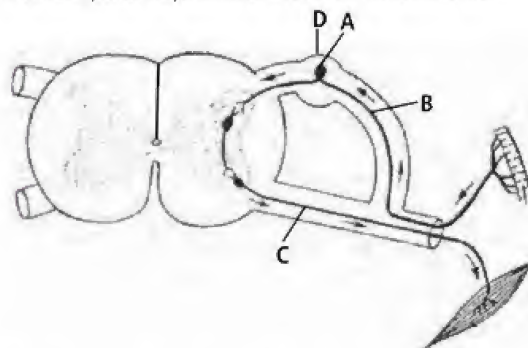
B

- (a) Polarised state Depolarised state
 (b) Depolarised state Polarised state
 (c) Threshold stimulus Repolarisation
 (d) Resting potential Polarised state

26. Which of the following is a mismatched pair?

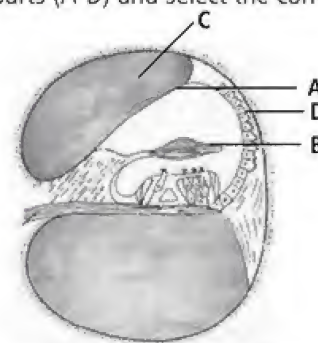
- (a) Cervical curvature – Neck region
 (b) Lumbar curvature – Pelvic region
 (c) Thin myofilament – Tropomyosin
 (d) Cardiac muscle – Intercalated disc

27. Observe the given diagram of reflex arc. Which of the labelled parts represents afferent nerve fibre?



- (a) A (b) B (c) C (d) D

28. Refer to the given diagram of T.S. of human cochlea. Identify the labelled parts (A-D) and select the correct option.



- (a) A-Tectorial membrane, B-Reissner's membrane, C-Stria vascularis, D-Scala vestibuli
 (b) A-Reissner's membrane, B-Tectorial membrane, C-Scala vestibuli, D-Stria vascularis
 (c) A-Scala vestibuli, B-Stria vascularis, C-Reissner's membrane, D-Tectorial membrane
 (d) A-Stria vascularis, B-Scala vestibuli, C-Tectorial membrane, D-Reissner's membrane

29. Read the given statements and select the correct option.

Statement A : Neurohypophysis is under the direct regulation of the hypothalamus.

Statement B : Neurohypophysis stores and releases two hormones called oxytocin and vasopressin which are actually synthesised by the hypothalamus.

- (a) Both statements A and B are correct and statement B is the correct explanation of statement A.
 (b) Both statements A and B are correct but statement B is not the correct explanation of statement A.
 (c) Statement A is correct but statement B is incorrect.
 (d) Both statements A and B are incorrect.

30. Read the following statements and select the correct option stating which ones are true (T) and which ones are false (F).

- I. Noradrenaline was the first neurotransmitter to be isolated from vagus nerve in frog heart.
 II. Nissl's granules are irregular masses of smooth endoplasmic reticulum present in neurons.

III. Ora serrata demarcates sensitive part of retina from its non-sensory part.

IV. Stapedius is the smallest muscle in our body.

	I	II	III	IV
(a)	T	T	F	F
(b)	T	F	T	F
(c)	F	F	T	T
(d)	F	T	T	F

31. Arbor vitae is present in

- (a) cerebrum (b) cerebellum
(c) midbrain (d) hypothalamus.

32. Select the option which correctly fills the given blanks.

A and B are compounds widely used by scientists to study cell physiology of islets of Langerhans.

Select the option which correctly fills the given blanks.

A	B
(a) Cobalt chloride	Aluminium chloride
(b) Cobalt chloride	Alloxan
(c) Alloxan	Aluminium chloride
(d) Alloxan	Potassium chloride

33. Which of the following gives the correct number of cranial bones?

- (a) 1-Frontal, 1-Parietal, 2-Temporal, 2-Occipital, 1-Sphenoid, 1-Ethmoid
(b) 1-Frontal, 2-Parietal, 2-Temporal, 1-Occipital, 1-Sphenoid, 1-Ethmoid
(c) 2-Frontal, 2-Parietal, 1-Temporal, 1-Occipital, 1-Sphenoid, 1-Ethmoid
(d) 2-Frontal, 1-Parietal, 1-Temporal, 2-Occipital, 1-Sphenoid, 1-Ethmoid

34. Read the following statements.

- I. Synaptic vesicles discharge their contents into the synaptic cleft.
II. Calcium ions enter the cytoplasm of presynaptic knob.
III. Depolarisation and generation of action potential in post-synaptic membrane.
IV. The neurotransmitter of the synaptic cleft binds with protein receptors on post synaptic membrane.

The correct sequence of these events taking place during synaptic transmission at chemical synapse is

(a) II, I, IV, III

(b) II, I, III, IV

(c) I, II, IV, III

(d) I, II, III, IV.

35. Match column I with column II and select the correct option. (There can be more than one match for items in column I.)

Column I	Column II
A. Telodendria	(i) Corpora quadrigemina
B. Mesencephalon	(ii) Splenium
C. Corpus callosum	(iii) Chlorolable
D. Cone cells	(iv) Synaptic knob
E. Lacrimal apparatus	(v) Lysozyme
	(vi) Genu
	(vii) Crura cerebri
	(viii) Erythrolable
	(ix) Terminal arborisation
	(x) Superior canaliculi

- (a) A-(iv), (x); B-(ii), (vii); C-(iii), (ix); D-(v), (i); E-(vi), (viii)
(b) A-(ii), (ix); B-(i), (vii); C-(iii), (vi); D-(iv), (viii); E-(v), (x)
(c) A-(iv), (ix); B-(i), (vii); C-(ii), (vi); D-(iii), (viii); E-(v), (x)
(d) A-(iv), (ix); B-(ii), (vii); C-(i), (v); D-(iii), (viii); E-(vi), (x)

36. Cori's cycle occurs in muscles and

- (a) heart (b) kidneys
(c) liver (d) spleen.

37. The hormone secreted by hypothalamus, pancreas and digestive tract is

- (a) somatotropin (b) somatostatin
(c) somatostatin (d) pitressin.

38. The group of spinal nerves collectively called as cauda equina is

- (a) cervical, lumbar and thoracic
(b) sacral, coccygeal and cervical
(c) thoracic, cervical and coccygeal
(d) sacral, lumbar and coccygeal.

39. Which of the following statement is incorrect about ilium?

- (a) It is a part of pelvic girdle.
(b) Peyer's patches are present in it.
(c) It is bony in nature.
(d) It is protective in function.

40. The part of the eye that absorbs oxygen from the air is

- (a) sclera (b) choroid
(c) cornea (d) iris.



Key is published in this issue. Search now! ☺

SELF CHECK



Check your score! If your score is

No. of questions attempted

No. of questions correct

Marks scored in percentage

> 90%	EXCELLENT WORK !	You are well prepared to take the challenge of final exam.
90-75%	GOOD WORK !	You can score good in the final exam.
74-60%	SATISFACTORY !	You need to score more next time.
< 60%	NOT SATISFACTORY!	Revise thoroughly and strengthen your concepts.

PMT



SINGLE OPTION CORRECT

This paper contains 50 **multiple choice questions**. Each question has four choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct. (Mark only one choice).

Marks : $50 \times 4 = 200$

Negative Marking (-1)

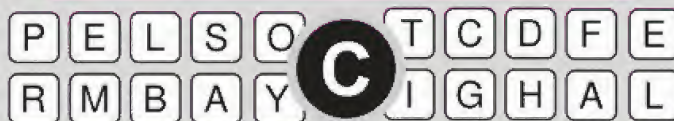
ANIMAL KINGDOM

- Which of the following is true regarding birds?
 - Skin dry without glands, except uropygial gland
 - Long bones pneumatic
 - Crop (modified expansion of oesophagus) for storage of food and gizzard for grinding of food, are two additional chambers in alimentary canal.
 - Legs are covered by scales.
 - Air sacs connected with lungs to supplement respiration
 - All except 'C'
 - All except 'A'
 - All except 'E'
 - All of these
- The most unique feature of mammals are
 - mammary glands and hair
 - diaphragm and hair
 - ear pinna and coccygeal bone
 - all of these.
- Amniotes comes under Class
 - Reptilia, Aves and Mammalia
 - Pisces, Aves and Mammalia
 - Cyclostomata, Reptilia and Mammalia
 - Pisces, Cyclostomata and Reptilia.
- Which of the following is true for all chordates?
 - Notochord-mid-dorsal, solid, ectodermal and provide support
 - Dorsal hollow nerve cord-mid-dorsal between notochord and alimentary canal
 - Paired pharyngeal gill slits
 - All of these
- Which of the following statements is wrong?
 - All vertebrates are chordates.
 - Protochordates are exclusively marine and includes hemichordates, urochordates and cephalochordates.
 - Urochordates like *Herdmania* show retrogressive metamorphosis.
 - Excretory organ in *Amphioxus* is flame cell.
- Animal (shown in the diagram), has which of the following feature?
 
 - Marine, carrying notochord throughout life.
 - It has a dorsal heart, body covered by tunic.
 - Adult sedentary, larva motile and larva is ammocoete.
 - Notochord present in tail region of larva, only.
- Which of the following statements is wrong?
 - Body of reptiles is covered by dry and cornified epidermal scutes.
 - Calotes* is commonly called as tree lizard.
 - Birds are homeothermic with sound producing organ as syrinx.
 - Bat differs from bird by containing diaphragm and ear pinna.
- Which of the following statements is true for shown animal?
 

- (a) It is a bony fish with four pair of gills with ctenoid scales.
 (b) It is a cartilaginous fish with seven pair of gills without operculum and ventral mouth.
 (c) It is 'sanguivorous fish' which migrate to fresh water for spawning.
 (d) None of the above
9. Read the following statements and select the correct ones.
 (1) Teeth of *Carcharodon* are mesodermal and modified ctenoid scales.
 (2) Electric ray *Trygon* is a cartilaginous fish.
 (3) Fighting fish and angelfish are common aquarium fish.
 (4) Amphibian, reptile, birds and egg laying mammals contain cloacal chamber.
 (5) Reptiles, bird and mammals are homiothermic.
 (a) 2 (b) 3 (c) 1 (d) None
10. How many of the following names are correctly matched?
 (1) Blue whale – *Balaenoptera*
 (2) Flying fox – *Pteropus*
 (3) Vulture – *Neophron*
 (4) Tortoise – *Chelone*
 (5) Sea horse – *Hippopotamus*
 (a) 3 (b) 2 (c) 4 (d) 1
11. Larva of salamander is
 (a) ammocoete (b) tadpole
 (c) axolotl (d) trochophore.
12. Gill cover, the operculum is present in
 (a) *Scoliodon* (b) flying fish
 (c) *Pristis* (d) *Trygon*.
13. Ammonotelic chordate of the following is
 (a) *Hippocampus* (b) *Pristis*
 (c) frog and toad (d) *Columba*.
14. Which of the following is a wrong match?
 (a) Tunicates – Adult is degenerated but larva is advanced
 (b) Chondrichthyes – Notochord persist throughout life
 (c) *Phrynosoma* – An amphibian commonly called as horn toad
 (d) Reptiles and Aves – Monocondylic
15. Which of the following feature is not found in osteichthyes?
 (a) Mesodermal teeth modified placoid scales
 (b) Anus and genital aperture separate
 (c) Mouth terminal
 (d) Operculum and hydrostatic organ (swim bladder)
16. Which of the following is a true fish?
 (a) Hag fish (b) Silver fish
 (c) Dog fish (d) Star fish
17. Fish with poisonous sting is
 (a) *Trygon* (b) *Torpedo*
 (c) *Hippocampus* (d) *Catla*.
18. 'Ectoparasite of fish' but itself a chordate and anadromus animal.
 (a) *Petromyzon* (b) *Myxine*
 (c) *Salmon* (d) Both (a) and (b)
19. Few characters are listed here. Select how many of them are found in birds.
 (1) Homeothermic (2) Monocondylic skull
 (3) 10 pair of cranial nerve (4) Cleidoic and shelled eggs
 (5) Urea nitrogenous waste
 (6) Beak is modified lips.
 (a) 3 (b) 4 (c) 1 (d) 2
20. Which of the following characters is absent in aves?
 (a) Sound producing vocal cords
 (b) Bipedal locomotion and legs covered by scales
 (c) Ossified endoskeleton with pneumatic bones
 (d) Four chambered heart and vestigial renal portal system
21. *Echidna* is a
 (a) scaly ant eater, a mammal
 (b) flightless bird
 (c) burrowing reptile
 (d) egg laying mammal or monotreme.
22. Which of the following assists in the locomotion of the organism stated ?
 (a) Clitellum of *Pheretima*
 (b) Pedicellaria of starfish
 (c) Trichocysts of *Paramecium*
 (d) Posterior sucker of *Hirudinaria*

Spellathon

1. Make as many biological terms as possible using the given letters. Each word should contain the letter given in circle.
2. Minimum 4 letter word should be made.
3. In making a word, a letter can be used as many times as it appears in the box.
4. Make at least 1 seven letter word.



Send your response at editor@mtg.in or post to us with complete address by 25th of every month to win exciting prizes. Winners' name will be published in next issue.

23. Which of the following is wrong statement?
- Snakes and lizards shed their scales as skin cast.
 - Reptile, fish and amphibian are poikilotherms.
 - Modern birds have well developed keel and wish bone.
 - All mammals contain whole body covered with hair.

24. Which of the following is true for the animal shown in the diagram?



- Show direct development and produces shelled cleidoic eggs
 - Shed skin cast formed of cornified scutes
 - Produces axolotl larva and show neoteny
 - None of these
25. Which of the following is an incorrect statement?
- Struthio* is the largest and flightless bird.
 - Whale is a largest and predacious chondrichthyes.
 - Flame cells are found in *Amphioxus*.
 - Reptiles creeps on soil surface.
26. Cyclostomes contain "false and some migrating fish" which of the following is true about them?
- Body is covered by ganoid and ctenoid scales.
 - Contain paired and unpaired fins.
 - Contain 6-15 paired gill slits.
 - Have ventral mouth and they are sanguivorous.
27. Animal with monocondylic skulls, metanephric kidney, poikilothermic and 12 pair of cranial nerves are
- reptiles
 - birds
 - fish
 - amphibians.
28. Cold blooded animal with 4 chambered heart is
- Columba*
 - Crocodila*
 - Testudo*
 - Shrew*.
29. Which of the following is correctly matched?
- Porifera – Spicules, external fertilisation and cellular level of body organisation
 - Cnidaria – Unsegmented, hypnotoxin, triploblastic and acoelomates
 - Nematoda – Triploblastic, pseudocoelomates and dioecious
 - Hemichordata – Proboscis gland, tubicolous, exclusively marine and enterocoelomates, lower chordates

30. Which of the following is wrong match?

- Astacus* – Edible fish
 - Cliona* – Boring sponge
 - Pennatula* – Sea pen
 - Nereis* – Marine annelid
31. Midventral solid central nervous system found in
- urn sponge
 - Hydra*
 - frog
 - earthworm.
32. Animals capable of tolerating wide range of salt concentration is
- euryhaline
 - euryphagic
 - eurythermal
 - euryberic.
33. Which of the following is false statement?
- Hemichordates are triploblastic, bilaterally symmetrical with open circulatory system.
 - Star fish has radially symmetrical larva and adult with bilateral symmetry.
 - Snail, like *Pila*, has radula as a rasping organ and osphradium as chemoreceptor.
 - Arthropods have chitinous exoskeleton and schizocoelic body cavity filled with blood.
34. 'Sea lily' belongs to Phylum _____ and biologically known as _____.
- Cnidaria, *Antedon*
 - Echinodermata, *Coralium*
 - Cnidaria, *Adamsia*
 - Echinodermata, *Antedon*
35. Which of the following is false regarding arthropoda?
- Triploblastic and enterocoelomates
 - Oviparous and commonly with indirect development
 - Ganglionated double ventral nerve cord constitute CNS
 - Body metamerically segmented and it contains 2/3 named species of animal kingdom.
36. Which of the following feature correctly represents echinodermata?
- Canal system helps in locomotion
 - Diploblastic, eucoelomates and deuterostomic
 - Exclusively marine, benthic and with organ system level of body organisation
 - Exoskeleton formed of calcareous ossicles carrying spines with mesodermal origin
37. Closed circulation found in
- earthworm
 - Sepia*
 - chordates
 - all of these.
38. *Taenia solium* lacks
- digestive system
 - hook
 - excretory and reproductive system
 - both (a) and (b).

39. In which one of the following, the genus name, its two characters and its phylum are not correctly matched?

Genus Name	Characters	Phylum
(a) <i>Pila</i>	(i) Body unsegmented (ii) Mouth with radula	Mollusca
(b) <i>Asterias</i>	(i) Spiny skinned (ii) Water vascular system	Echino-dermata
(c) <i>Sycon</i>	(i) Pore bearing (ii) Canal system	Porifera
(d) <i>Periplaneta</i>	(i) Jointed appendages (ii) Ventral heart	Arthropoda

40. Which of the following is a wrong statement?
- Hydra* egest through mouth and respire through general body surface.
 - Starfish has anus on aboral surface along with madreporite.
 - Platyhelminthes are triploblastic, pseudocoelomate and bilaterally symmetrical.
 - Aedes* mosquito act as a vector of virus causing dengue fever.

41. Which of the following is characteristic cell of *Sycon*?

- Flame cell
- Choanocyte
- Chloragogen cell
- Interstitial cell

42. *Adamsia*, an aquatic metazoan is characterised by which of the following group of features?

- Fresh water, diploblastic and biradial symmetry
- Marine, triploblastic, eucoelomate and radial symmetry
- Marine, diploblastic, acoelomate and with biradial symmetry
- Fresh water, diploblastic, schizocoelomate and radially symmetrical

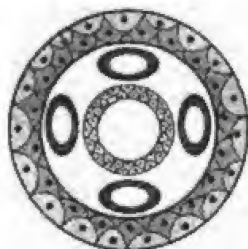
43. *Ascaris* is called common round worm because of

- spherical shape
- circular in outline
- spherical in T.S.
- circular in T.S.

44. The given diagram represents T.S. of germinal layers. How many of the following animals show this type of organisation?

Ascaris, *Wuchereria*, Pin worm, Earthworm, Flat worm, Clam worm, *Fasciola*, *Ancylostoma*

- 4
- 3
- 2
- 1



45. Maximum number of named species are found in which of the following class of organisms?

- Molluscs
- Insecta
- Arthropoda
- Cephalopoda

46. Most distinguishing feature of echinodermata is

- presence of canal system
- enterocoelom
- water vascular system
- haemal and perihemal system, only.

47. Match column I with column II and find the correct match.

Column I

- Porifera
- Hemichordata
- Aschelminthes
- Ctenophora
- Annelida

Column II

- Proboscis gland
- Syncytial epidermis
- Chloragogen cells
- Comb plates
- Choanocytes

- A-(v), B-(i), C-(iii), D-(iv), E-(ii)
- A-(v), B-(i), C-(ii), D-(iv), E-(iii)
- A-(v), B-(i), C-(iv), D-(ii), E-(iii)
- A-(v), B-(i), C-(iii), D-(ii), E-(iv)

48. Character shared by hook worm, pin worm and filarial worm

- pseudocoelomates
- circular in outline in T.S.
- syncytial epidermis
- all of these.

49. Tissue level body organisation found in

- bath sponge
- starfish
- jelly fish
- silver fish.

50. Alternation of two morphological different diploid generation in life cycle is called

- metagenesis
- metamorphosis
- metastasis
- none of these.

ANSWER KEY

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (d) | 2. (a) | 3. (a) | 4. (c) | 5. (b) |
| 6. (d) | 7. (b) | 8. (c) | 9. (a) | 10. (a) |
| 11. (c) | 12. (b) | 13. (a) | 14. (c) | 15. (a) |
| 16. (c) | 17. (a) | 18. (a) | 19. (a) | 20. (a) |
| 21. (d) | 22. (d) | 23. (d) | 24. (c) | 25. (b) |
| 26. (c) | 27. (a) | 28. (b) | 29. (c) | 30. (a) |
| 31. (d) | 32. (a) | 33. (b) | 34. (d) | 35. (a) |
| 36. (c) | 37. (d) | 38. (a) | 39. (d) | 40. (c) |
| 41. (b) | 42. (c) | 43. (d) | 44. (a) | 45. (b) |
| 46. (c) | 47. (b) | 48. (d) | 49. (c) | 50. (a) |



HIGH YIELD FACTS



Class XII

ORGANISMS AND POPULATIONS

- Ecology** is the branch of biology concerned with the study of inter-relationship between living organisms and their environment.
- The term ecology was coined by **Ernst Haeckel** in 1889.

Subdivisions of Ecology

Autecology

- Study of individual plant or the population of individual plant species in relation to environment.

Synecology

- Study of plant communities and their relationship with environment.

VARIOUS LEVELS OF ECOLOGICAL ORGANISATION

- The hierarchy in the levels of organisation connected with ecological grouping of organisms is called **ecological hierarchy** or **ecological levels of organisation**.

Individual

Basic unit of ecological hierarchy as it continuously exchanges materials and information with its environment. It is distinct living entity which carries out all life processes in its body, separate from those in other individuals. New individuals develop from pre-existing ones.

Population

Group of similar individuals in a particular geographical area or space.

Biotic community

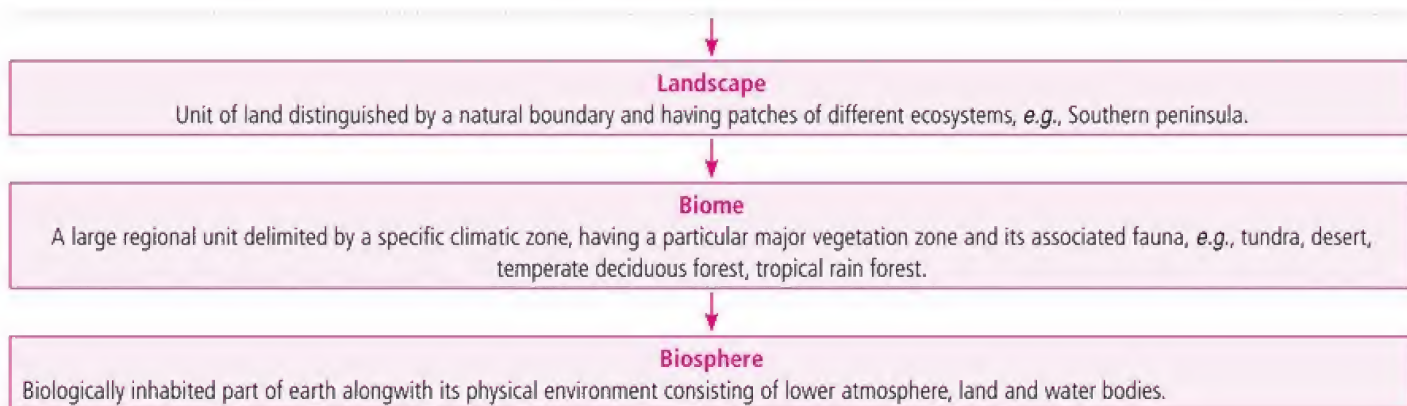
Assemblage of populations of different species of plants, animals, bacteria and fungi which live in a particular area and interact with one another through competition, predation, mutualism, etc.

Ecosystem

Segment of nature consisting of a biological community and its physical environment, both interacting and exchanging materials as well as energy, e.g., pond ecosystem.

Analysis of various PMTs from 2013-2017

	2013	2014	2015	2016	2017
AIPMT/NEET	3	1	3	6	4
AIIMS	1	2	-	1	3
AMU	1	1	5	-	-
Kerala	-	3	2	5	-
K-CET	-	3	-	4	-
J & K	-	2	1	1	-



ENVIRONMENT, WEATHER, CLIMATE, HABITAT AND NICHE

Environment

- It is the sum total of all biotic and abiotic factors, substances and conditions that surround and potentially influence organisms without becoming their constituent part. **Various components of environment are interlinked as well as interdependent.**

Weather

- The short-term properties of the atmosphere such as heat, cold, cloud, rain, wind, etc., at a given place and time is called weather.
- It varies from place to place at the same time and also at the same place at different times.

Climate

- It refers to the average weather conditions of a particular area.
- Temperature and rainfall are the most important factors that determine the climate of an area.**
- On the basis of variation in mean temperature along the latitude, four climatic zones have been recognised which is discussed in the table given below:

	Zone	Latitude	Average mean temperature	Winter season	Characteristic vegetation
(i)	Tropical zone	0°-20°	> 24°C	Nil	Tropical forests
(ii)	Sub-tropical zone	20°-40°	17°-24°C	Mild winter	Sub-tropical deciduous forests
(iii)	Temperate zone	40°-60°	7°-17°C	Winter with occasional snow	Mixed coniferous forests
(iv)	Arctic and Antarctic zone	60°-80°	< 7°C	Severe, prolonged winter with abundant snow	Arctic vegetation

Habitat

- Habitat refers to a specific place where a species normally lives. It is delimited by a combination of factors such as pond, desert, river, valley, saline soil, etc., where a community resides.
- For examples the habitat of the malarial parasite, *Plasmodium vivax* is the red blood corpuscles of human for a part of its life cycle and stomach of the female *Anopheles* mosquito for the other part of its life cycle.
- More than one animal or plant species may live in the same habitat.**

Niche

- This refers to the specific part of habitat occupied by individuals of a species which is circumscribed by its range of tolerance, range of movement, microclimate, type of food and its availability, shelter, type of predator and timing of activity.
- Tadpole and adult frog occupy different ecological niches as the former is herbivorous aquatic while the latter is carnivorous amphibian.
- An ecological niche supports a single species.** Each species occupies a distinct niche and no two species occupy the same niche.
- Sometimes unrelated organisms occupy same niche, though their habitats are different, known as **ecological equivalents**. In the same habitat, a common resource can be exploited by a group of species, called **guild**.

Differences between habitat and niche

Habitat	Niche
It refers to a specific physical area where a species lives.	It refers to the role a species plays in its habitat.
More than one species can live in the same habitat.	Only one species can live in one ecological niche.
Habitat of a species does not change.	A species may change its niche with age or season.

TERRESTRIAL BIOMES

- The major terrestrial biotic communities of the world, each comprising a characteristic array of plant and animal life are called **biomes**. The major terrestrial biomes of the world are:

Biomes

Coniferous Forest

Location : It occurs just south of tundra across North America, Europe and Asia and also in the Southern hemisphere.

Physical characteristics : Winters are quite chilly with long dark nights. The average winter temperature does not exceed 6°C. Summers are pleasant with long hours of day light and an average temperature of less than 20°C. Precipitation is highly variable and occur both as rain as well as snow.

Flora : Dominant vegetation consists of evergreen conifers which are able to tolerate wide fluctuations of temperature, light and soil. Such as pine, fir, spruce, deodar. The ground flora consists of herbs, ferns mosses and lichens.

Fauna : Animal community comprises of mouse, wolves, beavers, deer, rabbit, hare, squirrels, etc. During winter many animals hibernate or migrate to warmer places.

Tropical Rain Forest

Location : Mainly found in Central America, along Amazon and Orinoco rivers, South America. In India, tropical rain forests occur in Western Ghats, Assam and Andamans.

Physical characteristics : The biome occurs in equatorial or sub-equatorial regions where both rainfall and warmth are abundant. Plant growth is luxuriant. The forest is thick and almost impenetrable. As a result it is called **jungle**. Life is abundant in this biome as it has different varieties and number of plants and animals.

Flora : The vegetation shows stratification, i.e., grouping of plants in a forest into two or more well defined layers depending upon their height like tall trees, medium sized trees, small trees, bushes, herbs, etc. The different layers are called **strata** or **storeys**. Tropical rain forest is multistoreyed. Epiphytic growth is rich due to humidity. It includes orchids, lichens, mosses and ferns. Vines and lianas are abundant especially on the edges of the forests. The leaves of tall trees are leathery with drip tips for the flow of rain water.

Fauna : Each storey or stratum has different fauna. Upper storeys have birds, insects, bats, monkeys, tree frogs and lizards. Ground fauna includes many snakes, deer, forest goat, antelope, leopard, etc.

Tundra

Location : It occurs only in the arctic region and is, therefore, also called **arctic tundra**.

Physical characteristics : The area is covered by snow for most part of the year. The climate is, therefore, extremely cold with a winter temperature -30°C to -40°C and highest summer temperature of 10°C. Strong winds and snow storms are frequent. Part of the soil is in permanently frozen (**permafrost**) condition. Both vegetation and animal life are very scarce.

Flora : Vegetation is thin. It contains very sparse low growing vegetation devoid of any tree. Only those plants grow in tundra which either complete their life cycle in brief summer or can remain alive even when covered by snow for 8-10 months. They are shallow rooted as the subsoil is permanently frozen. *E.g.*, mosses and lichens. The plants possess xerophytic characters. Leaves are often small and hairy.

Fauna : Amphibians and reptiles are absent. Common animals of tundra are warm blooded and have protective coverings like feathers (birds) and hairy skins (mammals). Mammals have a thick layer of insulating fat below their skin. Main birds of tundra are snow owl and snow grouse while important mammals are polar bear, arctic hare, arctic fox and musk ox.

Temperate Deciduous Forest

Location : Found in both the Northern hemisphere and Southern hemisphere.

Physical characteristics : Have warm summer and moderately cold winter. Plant and animal life is rich.

Flora : The dominant climax vegetation consists of broad-leaved hardwood (dicot) trees like oak, maple, birch. Shrubs are also abundant. The trees and shrubs usually shed their leaves with the onset of autumn (hence also called fall) and new leaves are produced in early spring.

Fauna : The animal population, includes frogs, salamander, turtles, snakes, lizards, rabbits, hares, squirrels, etc. In winter, some animals undergo hibernation or migrate to warmer areas.

Chapparral

Location : Found in Mediterranean area (hence called **Mediterranean scrub forest**), Pacific coast of North America, Chile, South Africa and South Australia.

Physical characteristics : It is a broad-leaved evergreen shrub forest of hard and thick-leaved small trees and shrubs which usually contain resin but are resistant to fires. The area has frequent bush fires during 'dry' summer. Rainfall is during winter only. Both plants and animals are adapted to long droughts.

Flora : The common plants of chapparral are *Arctostaphylos*, sage, *Carnithus*, *Adenostemma*, oak and *Eucalyptus*.

Fauna : Animals include rabbits, rats, chipmunks, deer, snakes, lizards, birds, tiger, etc.

Desert Biome

Location : It is present in **rain shadow** (area beyond high mountains which cut off clouds, e.g., Tibet), lack of cloud intercepting mountains (e.g., Thar) or lying away from cloud seeding regions. E.g., Sahara (Africa), Gobi, Arabian and Thar of Asia. Rajasthan lies in the Thar desert.

Physical characteristics : Desert can be cold (e.g., Tibet, Gobi) or hot (e.g., Thar, Sahara). In true deserts, rainfall is less. Ground is sandy or rocky. Vegetation is sparse.

Flora : It consists of three types of plants. (i) Ephemerals or short lived annual herbs which grow during period when sufficient moisture is available. (ii) Cacti and other succulent xerophytes (e.g., *Euphorbia* species) which store water. (iii) Deep rooted shrubs and small trees which are able to obtain water from the water table, e.g., *Prosopis*, *Salvadora* *Tamarix*. Tall succulents, mostly cacti, are abundant in deserts.

Fauna : Common animals are kangaroo/desert rat, hare, fox, jackal, cat, rattle snake, coral snake, lizards. Camel is adapted to desert conditions as it can protect its eyes and nostrils from dust, has insulated spreading feet and is capable of tolerating dehydration upto 40% with highly reduced urine output.

Grassland

Location : Occurs in U.S.A, Canada, South America.

Physical characteristics : Summer is hot and winter is cold. Root system is extensive. Grazing and fire help to maintain grassland and prevent woody species to invade the area.

Flora : Grasses are dominant with non-graminaceous herbs, mostly leguminous (maintain nitrogen fertility of soil), scattered bushes and occasional tree.

Fauna : Consists of deer, elk, bison, wolf, prairie dog, bear, bighorn sheep, rabbit, mice, etc.

Tropical Deciduous Forest

Location : Occur in both plains and low hilly areas of North as well as South.

Physical Characteristics : Climate is warm with alternate wet and dry periods. The forests are lush green with dense foliage and herbaceous layer during the rainy season. During dry seasons, leaf fall occurs and the herbaceous layer dries up. Forest fires can occur. Many trees possess thick fire resistant bark. Soil is rich in nutrients due to seasonal leaf fall and slow humification.

Flora : Vegetation includes broad-leaved trees which shed their leaves during dry season, e.g., *Butea*, *Bombax*, sal (*Shorea*), teak (*Tectona*) and sandal (*Santalum*).

Fauna : Animal population is similar to that of evergreen tropical forests.

Tropical Savannah

Location : Occurs in North Australia, India, Central and Southern Africa including East - Central S. Africa.

Physical characteristics : Indian savannahs are largely anthropogenic being derived from tropical forests and maintained by grazing as well as fire. Availability of soil moisture determines composition and productivity.

Flora : Common trees and shrubs of Indian savannahs are *Acacia*, *Butea*, *Prosopis*, *Ziziphus* and *Capparis*. Many of them perform C_4 photosynthesis that is helpful in maintaining high productivity even under conditions of low soil moisture.

Fauna : Hoofed herbivores are quite common. Animals include antelope, zebra, giraffe, goat, rhinoceros, elephant, fox, wolf, lion, tiger, kangaroo, etc.

Altitudinal Biome

Location : Occurs near the top of very high mountains having permanent snow, e.g., Himalayas. It is treeless region and lies above the timberline.

Physical characteristics : Slopy, well drained with little peat or bog, herbaceous flowering plants and dwarfed trees.

Flora : Trees of lower region become tiny shrubs in this area. Other vegetation includes lichens, mosses, grasses, herbs and small shrubs like *Artemisia* and *Anemone*.

Fauna : Common animals include mountain goat, yak, wolf, snow leopard, snow bear, rabbit, willow grouse and some migratory birds.

ENVIRONMENTAL FACTORS

- Environmental or ecological factors are the constituents of environment which directly or indirectly influence the form and functioning of organisms in any specific way.

Environmental factors

Abiotic factors

These factors are non-living factors, substances and conditions of the environment which influence survival, form function, behaviour and reproduction of organisms. Major abiotic factors include temperature, water, light and soil.

Biotic factors

Living components of an environment constitute biotic factor, which interact with abiotic factors of the environment.

Abiotic Factors

1. Temperature

- It is the degree of hotness or coldness of a substance. It ranges from subzero levels in polar areas and high altitudes to more than 50°C in tropical deserts in summer.
- Changes in temperature are influenced by latitude, altitude, topography and vegetation.
- Most organisms survive a temperature range of 0° to 40°C.
- However, certain bacteria and blue green algae live in hot springs having a temperature range of 60° to 90°C.
- Temperature has a direct effect on the working of enzymes. Through enzymes, it influences basal metabolism, activity and other physiological functions of the organism.

Growth

- Rate of growth increases with the increase in temperature upto an optimum level beyond which it begins to decline. *E.g.*, eggs of Mackerel take 207 hours to hatch at 10°C and 5 hours to hatch at 21°C.

Reproduction

- Maturation of gonads and formation of gametes are controlled by temperature. In grasshopper, increase in temperature from 22°C to 32°C increases egg laying by 20-30 times. Beyond the optimum level, fecundity declines.

Sex Ratio

- *Daphnia* produces only females at normal temperature. It produces both males and females at higher temperature.

Various effects of temperature are

Colouration

- Animals have a darker skin in warm and humid areas and lighter skin in arid cool areas.

Behaviour

- Ticks and certain snakes (*e.g.*, Pit Viper) locate their warm blooded preys by body heat emitted by the latter.

Morphology

- In colder areas, the animal size generally increases while the extremities decrease.

Types of organisms depending on ability to tolerate temperature variations

Eurythermal organisms

Organisms which can tolerate a wide range of temperature variations, *e.g.*, most mammals and birds, *Artemesia tridentata* plants of Family Asteraceae.

Stenothermal organisms

Organisms which live within narrow range of temperature because of their requirement of nearly constant temperature throughout the year, *e.g.*, polar bear, lizards, amphibians, plants, etc.

Types of organisms depending on ability to maintain body temperature

Poikilothermal

- Body temperature varies with surrounding temperature
- Also known as *ectothermal* or *cold blooded animals*
- *E.g.*, reptiles, amphibians

Homoiothermal

- Keep body temperature constant despite changes in ambient temperature
- Also known as *endothermal* or *warm blooded animals*
- *E.g.*, birds, mammals

Adaptations to temperature

- Plants have various adaptations, such as hair, thick covering, mucilage, thick leaves to reduce transpiration and retain water.
- Animals of colder areas have thick coat of hair, scales, feathers or subcutaneous fat to reduce loss of body heat.
- **Gloger's Rule:** In warm blooded animals, including humans, pigmentation is little in colder areas, yellow brown to red in arid climates and black in humid hot areas.
- **Bergmann's Rule:** Warm blooded animals (birds, mammals) of colder areas are of larger size as compared to those of warmer areas.
- **Allen's Rule:** Extremities of mammals (ears, snout, tail, legs) of colder areas are shorter than those of warmer regions.
- **Rensch's Rule:** Birds of colder areas have narrow wings as compared to those of warmer areas.
- **Jordan's Rule:** Fish of cold water tend to have more vertebrae.

Thermoperiodicity

Regular change in body temperature that occurs at specific time interval.

Diurnal thermoperiodicity

Temperature is high during the day and low during night. High day temperature favours photosynthesis while lower night temperature stimulates growth and storage in plants. It promotes seed germination in many plants and determines the period of animal activity. For example, desert animals live in burrows, during the hot daytime.

Seasonal thermoperiodicity

Different seasons of year have different temperatures. They favour different aspects of plant and animal life or phenology. Seasonal thermoperiodicity, therefore, controls flowering, fruiting, fruit dispersal, leaf shedding, leaf bearing, seed germination, etc., of plants. In animals, it determines growth, reproduction, development, colouration and morphology.

Homeostasis

- The phenomenon of maintaining constant internal environment despite changes in external temperature is called homeostasis.
- Endothermal animals show homeostasis by:
 - Retaining heat produced by metabolic reactions.
 - Having an insulating coat in the form of thick skin, scales, hairs, feathers and subcutaneous fat.
 - Changing cutaneous circulation, constricting superficial blood vessels in cold and dilating them in hot weather.
 - Migration to warmer areas in winter and cooler areas in summer.



WHO AM I ...

"I have the ability to regulate body functions to certain limit, as beyond that limit I become conformer."

...search me ☺

2. Light

- Various life processes are influenced by intensity, duration and quality of light.

Photosynthesis

- The amount of photosynthesis depends upon the quality, intensity and duration of light. Photosynthetic yield is maximum at equator and tropical areas.

Transpiration

- Stomata generally open in light and close in darkness, because of it light promotes transpiration. Transpiration is further enhanced by heating effect of light.

Pigmentation

- Animals develop dark colour in dim light and light colour in bright light. In humans, prolonged exposure to light causes **tanning** or darkening of skin. Some animals show seasonal colour changes.

Daily rhythm

- Most animals are active during a particular period of the day. (i) **Diurnal** : Active during the daytime, e.g., butterflies, most birds, most mammals. (ii) **Nocturnal**: Active during night, e.g., rat, owl, cockroach. (iii) **Auroral** : Active at dawn or early morning, e.g., *Bubalus*. (iv) **Vesperal** : Active at the time of dusk or sunset, e.g., Rabbit. (v) **Crepuscular** : Active during the dawn and dusk e.g., fireflies and deer.

Growth

- It is favoured by increased availability of food, moderate light intensity and red light. Blue light favours moderate and normal growth. High light intensity reduces growth but increases development of mechanical tissues.

Germination

- Most of seeds are sensitive to light. They are called **photoblastic seeds**. Positively photoblastic seeds germinate only in the presence of light, e.g., *Viscum*, *Lactuca* and *Rumex*. Negatively photoblastic seeds do not germinate in presence of light, e.g., onion, tomato, etc.

Movement

- Small photosynthetic organisms show positive phototaxis in moderate light, e.g., *Chlamydomonas*, *Euglena*, *Volvox*, etc. In positive **phototropism**, plant shoots bend towards the source of light. Flowers of some plants open or close in response to light and darkness known as **photonasty**. **Nyctinasty** is folding of leaves in response to darkness. *Planaria* and earthworm generally show negative phototaxis.

Photoperiodism

- Response of organism to number and duration of day lengths. Organisms show three types of response to light duration - short day, long day and day neutral. Seasonal activities of organisms controlled by photoperiodism are bird migration, hibernation, flowering and vegetative growth.

Life Processes

Light Zones in Aquatic Habitats

- Zones in lake water are determined by gradients of light, oxygen and temperature from the water surface to lake bottom.

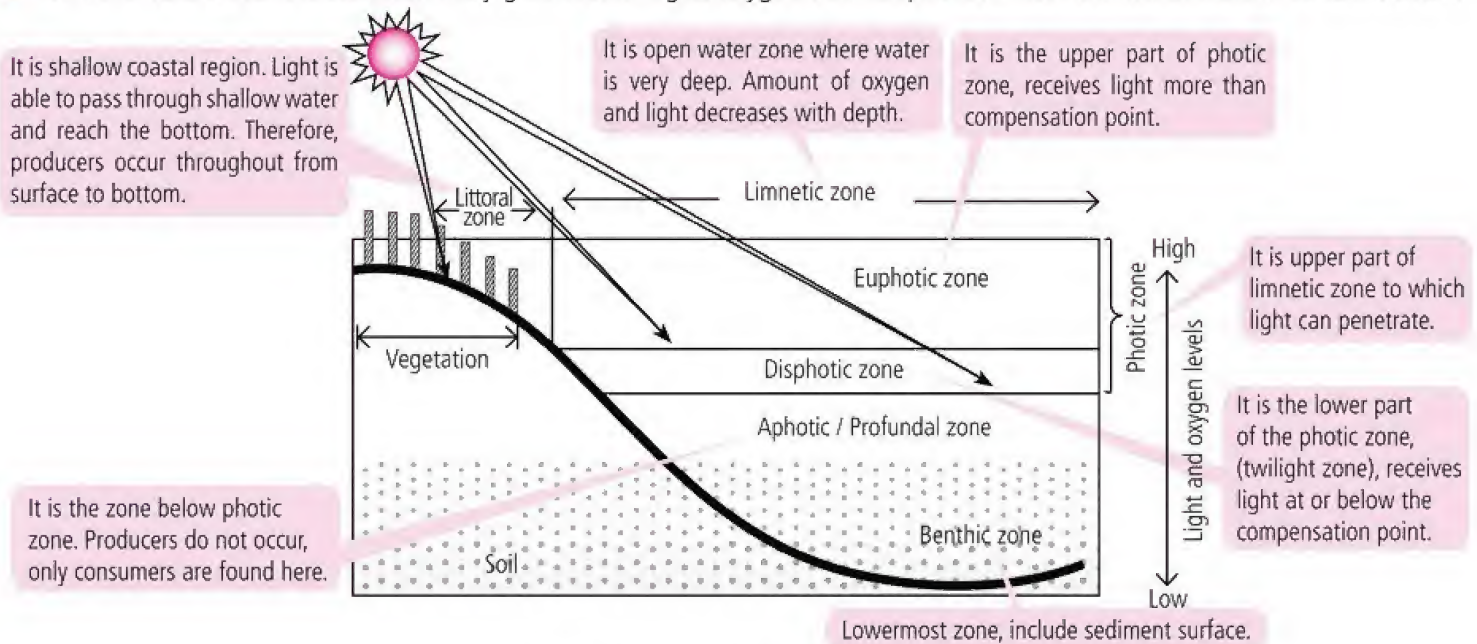
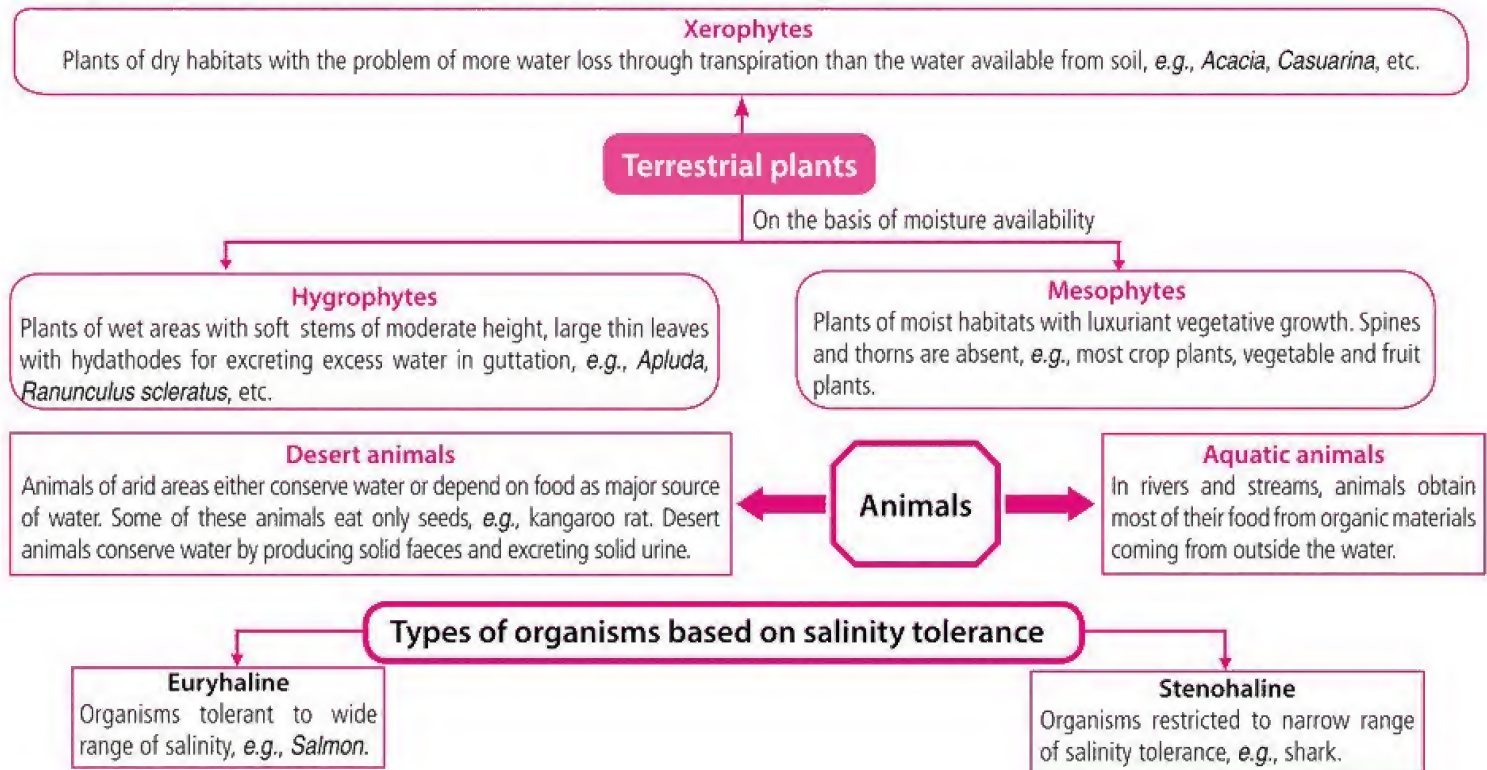


Fig.: Light zones in deep lake and ocean

3. Water

- Water forms about 71% of the earth's surface and represents the most extensive habitat for the organisms.
- Productivity and distribution of land plants depends on availability of water.



4. Soil

- The fertile surface layer of the earth capable of supporting plant growth is called soil.
- Humus is the most important part of the soil that makes the soil porous, thereby increasing its air and water-holding capacity.
- Total soil water content or holdard consists of two parts - chresard (water available to plants) and echard (water not available to plants).
- A soil profile consists of several soil horizons.

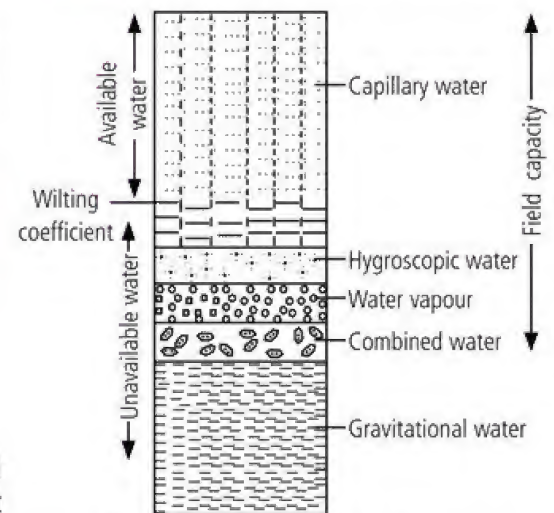
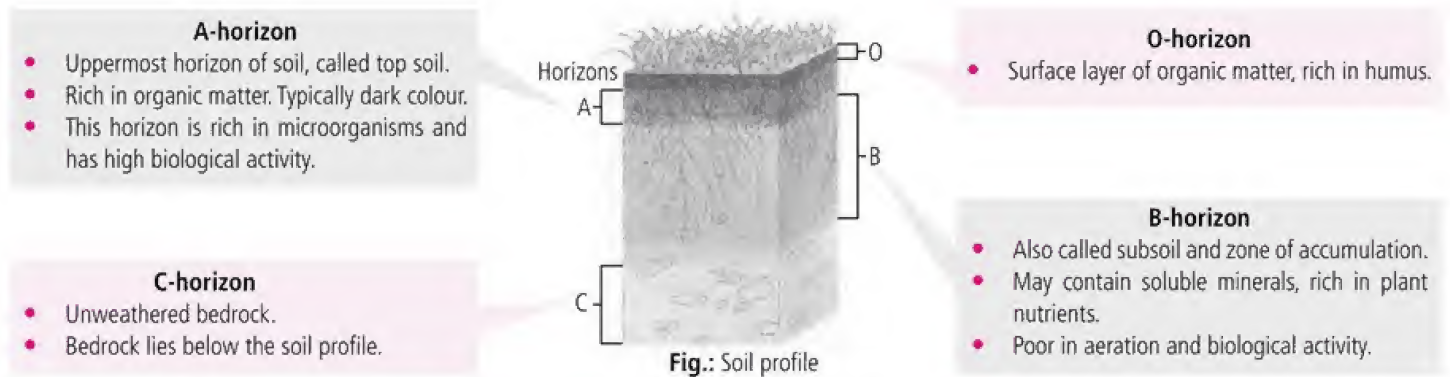


Fig.: Various fractions of soil water

Responses to Abiotic Factors

- Living organisms cope with stressful conditions by various methods:

Regulate

- Some organisms are able to maintain a constant body temperature and constant osmotic concentration despite changes in the external environment are known as **regulators**. **Only birds and mammals and a very few lower vertebrates and invertebrates belong to the category of regulators.** All perform homeostasis mostly through thermoregulation and osmoregulation by physiological adjustments and rarely by behavioural changes.

Conform

- Most of the animals and nearly all plants do not have a mechanism to maintain a constant internal body environment. Their body temperature changes with the surrounding temperature. These animals and plants in which the osmotic concentration and temperature of body changes according to ambient conditions of water are called **conformers**. Some species are **partial regulators** as they have the ability to regulate body functions to a limited extent; because beyond that limit they become conformers.

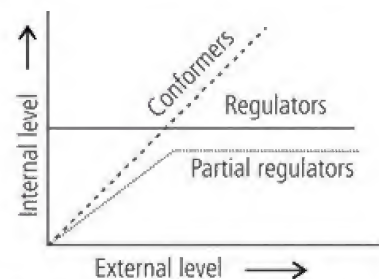


Fig.: Diagrammatic representation of organismic response

Migrate

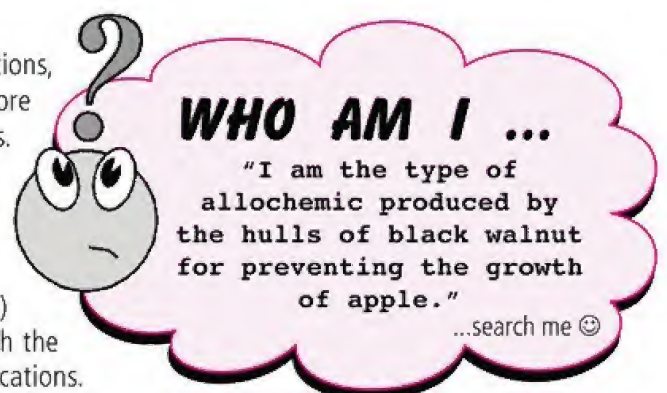
- The organisms included can migrate temporarily from the unfavourable habitat to more favourable area and return when unfavourable period is over. For example, thousands of migratory birds comes in India from Siberia every winter.

Suspend

- Organisms stop their development to survive unfavourable conditions, *e.g.*, Bacteria, fungi and lower plants develop thick walled spore during unfavourable conditions and germinate in suitable conditions. Polar bears undergo hibernation to escape cold, snails undergo aestivation and zooplanktons enters diapause stage.

Biotic Factors

- These are the living organisms (plant, animals and micro-organisms) who depict interactions not only among themselves but also with the physical environment. All kinds of interactions bring about modifications.



- Man is always most important biotic factor. He changes the environment by his activities regularly, e.g., by excessive cutting of trees, fire, domestication of plants and animals, by causing different types of pollution, etc.

ADAPTATIONS

- Adaptation is any attribute of the organism (morphological, physiological or behavioural) that enables it to survive and reproduce in its habitat.

Plant Adaptations

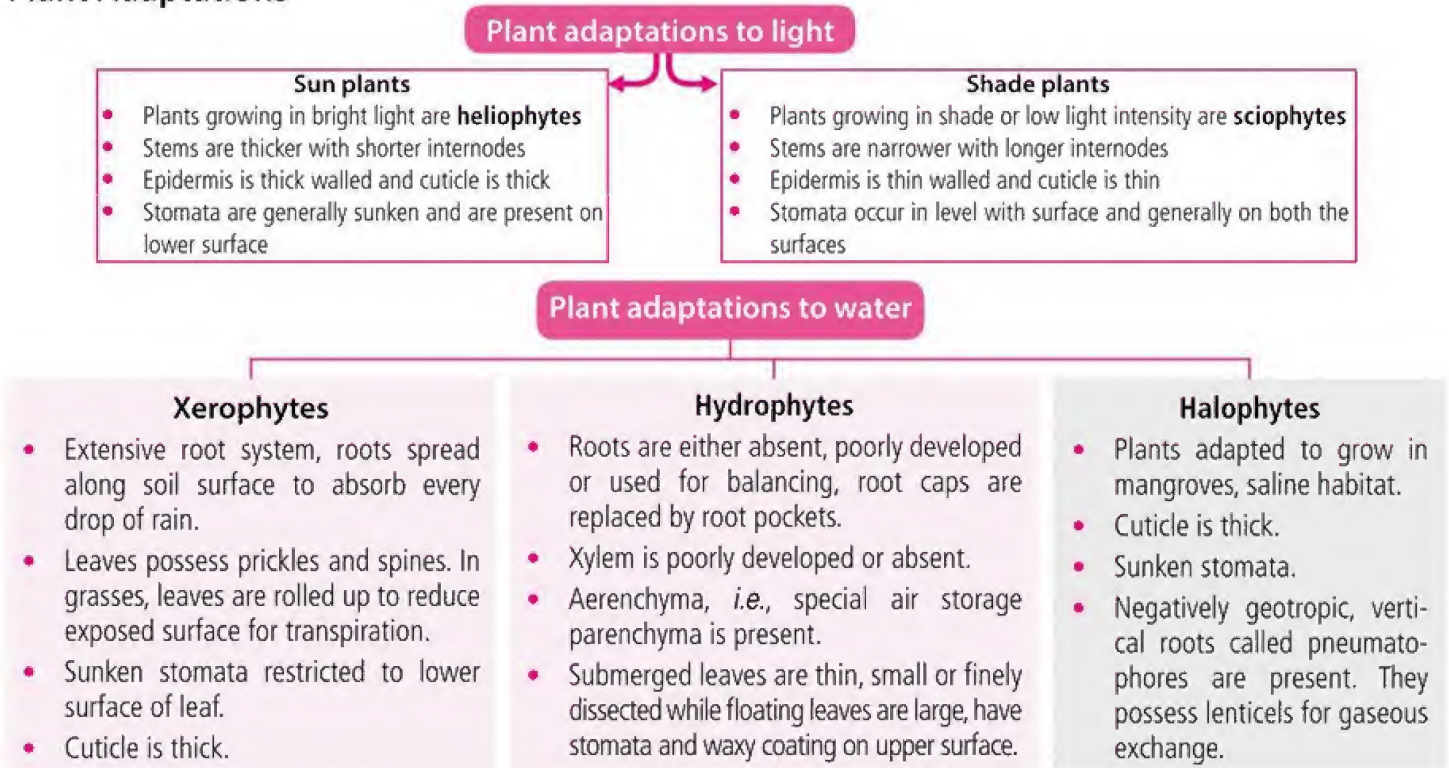


Table: Adaptations of animals

	Type of adaptation	Activity	Example
(i)	Migration	Two-way movement of an animal group to other places for food, climate and breeding.	
	(a) Daily migration	Migration between feeding and resting places.	Blackbird
	(b) Seasonal migration	Migration to avoid stressful and inhospitable seasons.	Arctic tern
	(c) Periodic migration	When population increases beyond feeding capacity, large population migrate to various directions in search of food.	Locust
(ii)	Camouflage	Ability to blend with the surroundings to remain unnoticed for protection or aggression.	Grasshopper and Praying Mantis
(iii)	Mimicry	Resemblance of one species with another in order to obtain advantage, especially against predation. The species which is imitated is called model while the animal which imitates is known as mimic .	
	(a) Batesian mimicry	Resemblance to a dangerous or unpalatable model so that the predator usually does not prey upon it.	Viceroy butterfly mimics unpalatable toxic Monarch butterfly
	(b) Mullerian mimicry	Resemblance of two animal species, especially insects, both unpalatable or ferocious, to their mutual benefit.	Monarch butterfly and Queen butterfly
(iv)	Echolocation	Producing high frequency sound which produce echoes after striking various objects, it helps to locate path and predators.	Bats and whales
(v)	Hibernation	Undergo winter sleep, body temperature drops, breathing and heartbeat become slow.	Northern ground squirrels
(vi)	Aestivation	Avoid heat by spending dry-hot period in a torpid (dormant) state into burrows.	Ground squirrels of South Western deserts

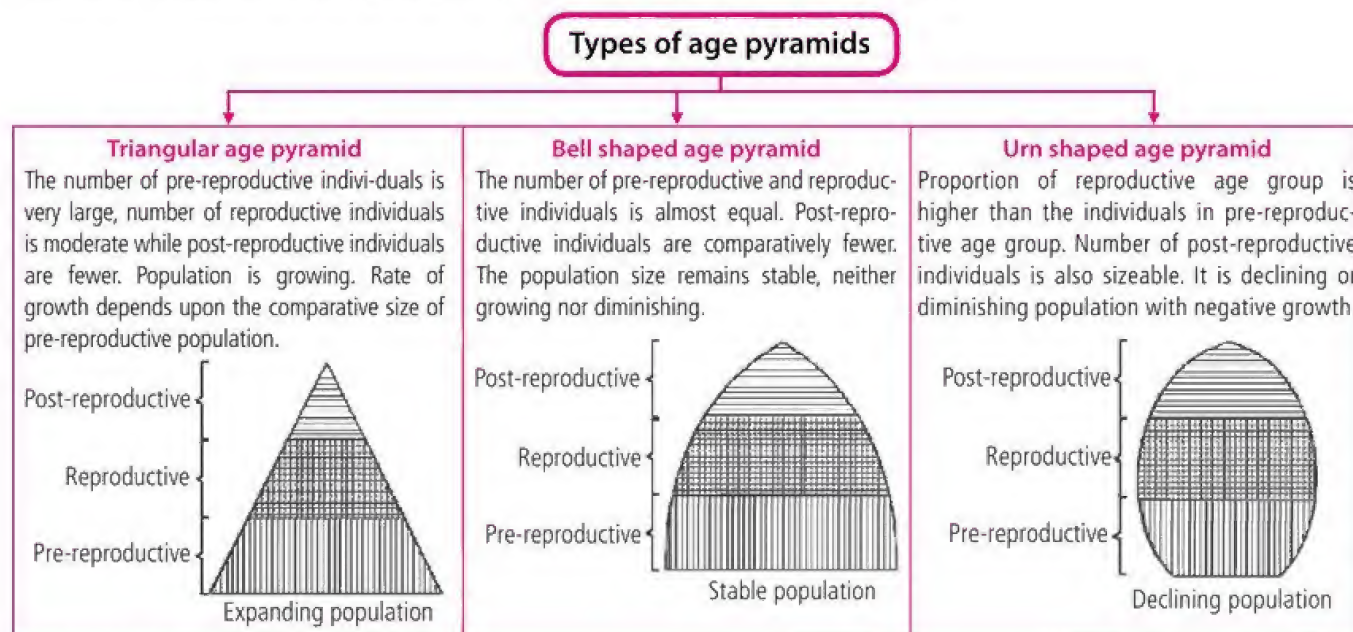
(vii)	Behavioural adaptations	Keep their body temperature fairly constant by behavioural means. They enjoy in the sun and absorb heat when their body temperature drops below the comfort zone, but move into shade when the surrounding temperature starts increasing.	Desert lizards (Desert lizards lack the physiological ability that mammals have to deal with the high temperature).
(viii)	Physiological adaptations	At high altitudes, the body does not get enough oxygen due to low atmospheric pressure, known as altitude sickness . The body compensates low oxygen availability by increasing red blood cell production, decreasing the binding capacity of haemoglobin and by increasing breathing rate.	Tribes living in the high altitude of Himalayas.

POPULATIONS

- A population may be defined as a group of organisms of the same species occupying a particular space in a given time.
- The basic characteristic of a population is its **size** or **density** which is affected by four primary population parameters such as **natality** (births), **mortality** (deaths), **immigration** and **emigration**.

Age Pyramids

- Graphic representation of different age groups found in a population with pre-reproductive groups at the base, reproductive ones in the middle and post-reproductive groups at the top is called **age pyramid**.

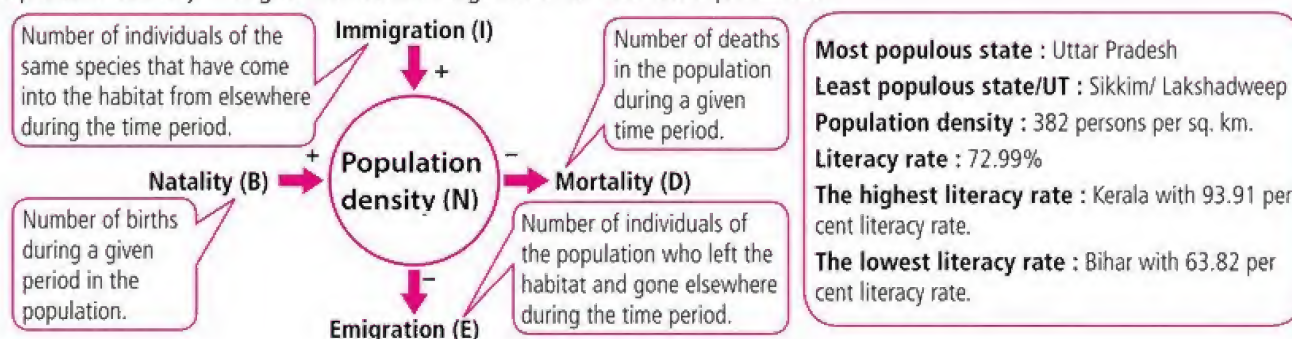


Population Density

- It is the number of individuals of a species per unit area/space at a given time. The formula is:

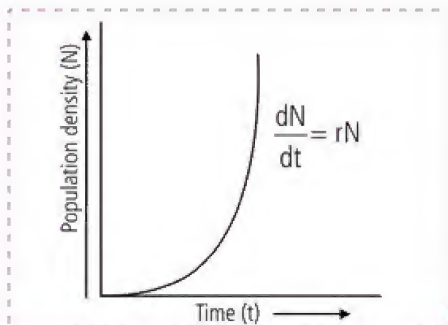
$$\text{Population density (D)} = \frac{\text{Number of individuals (N)}}{\text{Space (S)}}$$

- Population density in a given habitat changes due to four basic processes:



- If N is the population density of time t , then its density at time $t + 1$ is:

$$N_{t+1} = N_t + [(B + I) - (D + E)]$$



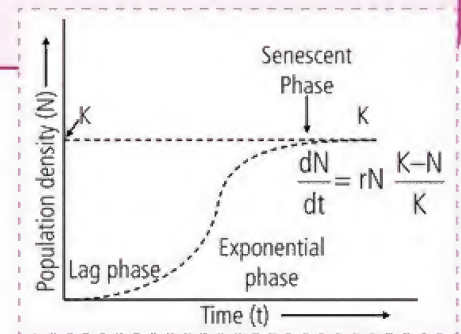
Exponential growth

- When resources like food and space are unlimited, population grows in an exponential or geometric ratio, resulting in J-shape curve.
- $\frac{dN}{dt} = rN$ (r is intrinsic rate of natural increase)
- It has two phases, lag and log.
- It occurs in fewer organisms, e.g., Lemmings and algal bloom.

Growth Models

Logistic growth

- Population shows initially a lag phase, followed by phases of increase and decrease and finally the population density reaches the carrying capacity (K), beyond which no further growth is possible, resulting in a sigmoid curve (S - Shape curve).
- Verhulst-Pearl logistic growth equation is- $\frac{dN}{dt} = rN \left(\frac{K-N}{K} \right)$
- It has four phases-lag, log, deceleration and steady.



POPULATION INTERACTIONS

1. Parasitism

- It is a relationship between two living organisms of different species in which one organism called **parasite** that obtains its food directly from another living organism called **host**.
- The parasite is smaller as compared to its host. It spends a part or whole of its life on or in the body of the host.

Table: Characteristics of different types of parasite

	Type of parasite	Characteristics
(i)	(a) Ectoparasite (b) Endoparasite	Live over the surface of host, e.g., sucking lice, aphids. Live inside the host's body, can be intracellular, body fluid parasite, gut parasite, e.g., <i>Ascaris</i> , <i>Trypanosoma</i> .
(ii)	(a) Temporary parasite (b) Permanent parasite	Live in contact with host for only a part of their life, e.g., bed bug, leech. Live in contact with host throughout their life. They are transferred to new host as egg, cyst or directly, e.g., <i>Ascaris</i> , <i>Entamoeba</i> and lice.
(iii)	(a) Holoparasites (b) Hemiparasites	Parasites which are completely dependent on the host for all their requirements, e.g., <i>Rafflesia</i> , <i>Cuscuta</i> , etc. Parasite which receive only a part of nourishment from the host while the rest is manufactured by them, e.g., <i>Viscum</i> (Mistletoe) and <i>Loranthus</i> .
(iv)	Stem and root parasites	Parasitic on plants and are in contact with the host plant either in the region of stem (e.g., <i>Cuscuta</i> , <i>Viscum</i> , stem borer, lac insect, etc., or root (e.g., <i>Rafflesia</i> and root nematodes).
(v)	(a) Non-pathogenic parasite (b) Pathogenic parasite	Parasite may not harm the host either because it deprives the host of only a fraction of food or is dependent on the host for its dead tissues only, e.g., <i>Entamoeba coli</i> . Parasites cause diseases in the host, e.g., <i>Vibrio cholerae</i> (cholera), <i>Corynebacterium diphtheriae</i> (diphtheria), etc.
(vi)	Hyperparasite	Parasite which lives on another parasite, e.g., some bacteriophages (bacterial viruses), bacterium e.g., <i>Pasteurella pestis</i> in <i>Xenopsylla cheopsis</i> (Rat Flea) that is an ectoparasite of rat.
(vii)	Brood parasitism	Parasitic bird lays its eggs in the nest of its host and the host incubates them. During the course of evolution, the eggs of the parasite bird have evolved to resemble the host's egg in size and colour to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest, e.g., cuckoo (parasitic bird) and crow (host bird).

2. Competition

- It is a rivalry between two or more organisms for obtaining the same resources.
- It can be intraspecific (among individual of same species) or interspecific (among members of different species).

Table: Differences between intraspecific and interspecific competition

	Intraspecific competition	Interspecific competition
(i)	It is competition among individuals of the same species.	It is competition amongst the members of different species.
(ii)	The competition is for all the requirements.	The competition is for one or a few requirements.
(iii)	The competing individuals have similar type of adaptations.	The competing individuals have different types of adaptations.
(iv)	It is more severe due to similar needs and adaptations.	It is less severe as the similar needs are few and the adaptations are different.

Gause's hypothesis (Principle of competitive exclusion)

"Competitive Exclusion Principle" states that two closely related species competing for same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.

3. Predation

- It is an interaction between members of two species in which members of one species capture, kill and eat up members of other species. The former are called **predators** while the latter are spoken as **preys**.
- Examples of simple predation include tigers and deer, frogs and insects, owls and rats, sea snake and eggs.
- For plant, herbivores are the predators. Nearly 25% of all insects are known to be **phytophagous** (feeding on plant sap and other parts of plants).
- Plants, have evolved an astonishing variety, of morphological and chemical defences against herbivores. Thorns and spines (*Acacia*, cactus) are the most common, morphological means of defence.
- Many plants produce and store chemicals that make the herbivore sick when eaten, inhibit feeding or digestion, disrupt its reproduction or even kill it. For example, *Calotropis* a type of weed growing in abandoned fields produces highly poisonous cardiac glycosides which acts as defences against grazers and browser (any cattle or goat).

4. Amensalism

- In amensalism one organism inhibits the effect of the other and the organisms inhibiting does not gain much benefit. **This inhibition is done by secreting allochemicals.**
- The process of preventing growth of other organisms through secretion of toxic chemicals is called **allelopathy**.
- Examples : *Convolvulus arvensis* inhibits germination of wheat seeds. *Trichoderma* checks growth of fungus *Aspergillus*, *Chlorella* in case of diatom *Nitzschia frustulum*, *Tagetes* kills soil nematodes by secreting toxic chemicals while black walnut (*Juglans nigra*) produces allochemical **juglone** for preventing growth of apple, tomato, alfalfa, etc.

5. Commensalism

- When two or more animals live together and if there is no physiological dependence between them, they are referred to as commensals and the relationship between such organisms is called **commensalism**. **In commensalism one animal might get the benefit from the association while the other is neither benefitted nor harmed.**
- Many epiphytes, e.g., orchids, bromeliads and some ferns are found growing on the branches and in the forks of trees. These epiphytes use the trees only for attachment and manufacture their own food by photosynthesis.
- E.g., Sucker fish (*Remora*, *Echeneis*) attaches itself to the under-surface of shark with the help of its dorsal fin which is modified into holdfast.

6. Mutualism

- It is the mutual beneficial relationship between individuals of two different species where none are capable of living separately. (Mutualism and symbiosis are synonym). **The association is obligatory, i.e., necessary for existence of both.**
- The classical example of this type of associations is seen in lichens. The lichens are composed of a matrix formed by a fungus within which cells of alga are embedded. **The alga depends upon the fungus for water, minerals and protection and fungus receives carbohydrates prepared by the alga.**

- Another well known example of mutualism is furnished by the bacteria of the genus *Rhizobium*. These bacteria form nodules on the roots of leguminous plants and obtain carbohydrates and other substances from the plants. In return, the bacteria fix the gaseous nitrogen and pass it on to the host. *E.g.*, root nodules of legumes alder and *Casuarina*.

7. Protocooperation

- In this association, two organisms are mutually benefitted by each other but the association is non-obligatory, *i.e.*, not necessary for their existence.
- *E.g.*, Cattle egret (*Bubulcus ibis*) feeds on lice and ticks of cattle, crocodile bird (*Pluvianus aegyptius*) rids crocodile of leeches sticking inside its mouth while shrimp eats up the parasites on the body of fish.

Table: Types of biotic interactions

	Interaction	Species A	Species B	Nature of interaction
(i)	With positive effect			
	Mutualism	+	+	Beneficial to both, obligatory
	Protocooperation	+	+	Beneficial to both, not obligatory
	Commensalism	+	zero	Commensal benefitted, other unaffected
(ii)	With negative effect			
	Parasitism	+	–	Parasite (usually small) benefitted, host harmed
	Predator	+	–	Predator (generally larger) kills and feeds on prey
	Competition	–	–	Mutual inhibition in direct competition and due to short supply of resources in indirect competition
	Amensalism	–	zero	One inhibited, other unaffected

SPEED PRACTICE

- Bell-shaped age pyramid is possible when
 - post-reproductive individuals are more than reproductive individuals
 - pre-reproductive individuals are almost equal to reproductive individuals
 - reproductive individuals are more than pre-reproductive individuals
 - pre-reproductive individuals are almost equal to post-reproductive individuals.
- Which among the following is an example of behavioural adaptation?
 - Altitude sickness on going to high altitude.
 - Excretion of concentrated urine by camels.
 - Developing ice nucleating proteins in extracellular spaces in body.
 - Desert lizards living in burrows to escape from heat.
- The type of interaction present between sucker fish and shark is
 - protocooperation
 - parasitism
 - commensalism
 - mutualism.
- Which of the following best describes Rensch's rule?
 - Extremities of mammals of colder regions are shorter than those of warmer regions.
 - Fish of cold water level tend to have more vertebrae.
 - Birds of colder areas have narrow wings as compared to those of warmer areas.
 - Warm blooded animals of colder areas are of larger size as compared to those of warmer areas.
- An ecological component of habitat which is delimited by functioning of an organism is
 - habitat
 - guild
 - environment
 - niche.
- An example of vesperal organism is
 - butterfly
 - rabbit
 - rat
 - Bubalvus*.
- Which horizon of soil profile is saturated with moisture and represents the water table?
 - O-horizon
 - A-horizon
 - B-horizon
 - C-horizon

8. Resemblance of Monarch butterfly and Queen butterfly is an example of
 (a) camouflage (b) warning colouration
 (c) Mullerian mimicry (d) Batesian mimicry.

9. Read the following statements and fill up the blanks with correct option.

- (i) Total soil water content in soil is called _____.
 (ii) Soil water not available to plants is called _____.
 (iii) Soil water available to plants is called _____.

- | (i) | (ii) | (iii) |
|--------------|--------|----------|
| (a) echard | holard | chresard |
| (b) chresard | echard | holard |
| (c) holard | echard | chresard |
| (d) chresard | holard | echard |

10. Identify the A, B, C and D in the given table.

Population interaction	Effect on species X	Effect on species Y
Parasitism	A	–
B	+	+
Amensalism	–	C
D	–	–

- | | A | B | C | D |
|-----|---|------------------|---|-------------|
| (a) | + | Protocooperation | 0 | Competition |
| (b) | – | Commensalism | 0 | Competition |
| (c) | + | Mutualism | + | Predation |
| (d) | + | Mutualism | + | Predation |

11. Periodic migration is seen when
 (a) birds migrate by using direction
 (b) whales migrate in search of food
 (c) phytoplanktons rise to water surface
 (d) large population of locust migrate in search of feeding ground.
12. Match the following column I (forest type) with column II (mean annual rainfall) and select the correct option.

- | Column I | Column II |
|-------------------------------------|----------------|
| (i) Tropical Deciduous Forest | (p) 50-170 cm |
| (ii) Coniferous Forest | (q) 90-160 cm |
| (iii) Temperate Broad Leaved Forest | (r) 200-350 cm |
| (iv) Tropical Rain Forest | (s) 100-250 cm |
- (a) (i)-(q); (ii)-(p); (iii)-(s); (iv)-(r)
 (b) (i)-(s); (ii)-(r); (iii)-(p); (iv)-(q)
 (c) (i)-(p); (ii)-(q); (iii)-(s); (iv)-(r)
 (d) (i)-(q); (ii)-(r); (iii)-(p); (iv)-(s)

13. Which among the following represents protocooperation interaction?

- (a) Crocodile bird helping crocodile to get rid of leeches by entering the crocodile's mouth.
 (b) *Trichoderma* inhibiting the growth of fungus *Aspergillus*.

- (c) Malarial parasite living in human RBCs.
 (d) *Entamoeba* living in contact with host throughout the life.

14. Salt glands are found in

- (a) *Sagittaria* (b) *Atriplex*
 (c) *Lemna* (d) *Aloe*.

15. Select the correct statement regarding conformers.

- (a) They maintain their body temperature.
 (b) They consume lesser amount of energy.
 (c) They have a wide range of distribution.
 (d) They have a fixed osmotic concentration of their body fluids.

16. Identify the correct sequence of ecological hierarchy starting from lower to higher level.

- (a) Population → Biotic community → Biome → Landscape
 (b) Landscape → Ecosystem → Biome → Biosphere
 (c) Individual → Population → Landscape → Ecosystem
 (d) Biological community → Ecosystem → Landscape → Biome

17. Identify the correctly matched pair.

- | | | |
|---------------------------|---|---|
| (a) Anadromous migration | - | Migration of Eel from freshwater to sea for spawning. |
| (b) Phenotypic adaptation | - | Adaptation which allow organisms to respond quickly to an unfavourable situation. |
| (c) Diapause | - | Desert lizards moving to burrows in soil to escape heat. |
| (d) Cold hardening | - | Polar bears develops glycerol to lower freezing point of body fluids. |

18. Select the correct features of adaptations for parasitic life.

- (i) Presence of adhesive organs
 (ii) Well developed reproductive organs
 (iii) Presence of complicated digestive system
 (iv) Loss of unnecessary organs
 (a) (i) and (iii) (b) (i), (ii) and (iv)
 (c) (ii), (iii) and (iv) (d) (ii) and (iii)

19. Read the given statements and select the correct option.

Statement A : Cattle do not graze on weed, *Calotropis*.

Statement B : *Calotropis* have thorns and spines, as defense against herbivores.

- (a) Both statements A and B are correct and B is the correct explanation of A.
 (b) Both statements A and B are correct but B is not the correct explanation of A.
 (c) Statement A is correct but statement B is incorrect.
 (d) Both statements A and B are incorrect.

20. Which of the given statements are incorrect for exponential growth model?
- It has four phases - lag, log, deceleration and steady.
 - It occurs when the resources are abundant.
 - Population seldom grows beyond the carrying capacity of ecosystem.
 - A stationary phase is achieved.
- (i), (iii) and (iv)
 - (ii) and (iii)
 - (ii), (iii) and (iv)
 - (i), (ii) and (iv)
21. What is the growth equation for a population provided with limited resources?
- $\frac{dN}{dt} = rN$
 - $\frac{dN}{dt} = rN \left(\frac{K-N}{K} \right)$
 - $\frac{dN}{dt} = rN \left(\frac{N}{K} - 1 \right)$
 - $\frac{dN}{dt} = rN - 1$
22. Read the statements and select the correct option.
- In endoparasites, respiration is often aerobic.
 - The urn shaped age pyramid shows diminishing population with negative growth.
 - Immigration occurs when there is loss of some alleles from the gene pool.
 - Natality maintains health of the population.
23. Proline, useful in maintaining osmotic and water potential is present in
- mesophytes
 - hygrophytes
 - halophytes
 - xerophytes.
24. Select the incorrect plants of drought escapers.
- Euphorbia*
 - Tribulus*
 - Boerhaavia*
 - Asparagus*.
25. Identify the correct biome from the given features.
- Highly delicate and fragile biome
 - Takes long period to recover from a minor disturbance.
 - Plants possess xerophytic characters.
 - Shore and water birds visit the area during summer.
- Coniferous forest
 - Chapparal
 - Tundra
 - Savannah

ANSWER KEY

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (b) | 2. (d) | 3. (c) | 4. (c) | 5. (d) |
| 6. (b) | 7. (d) | 8. (c) | 9. (c) | 10. (a) |
| 11. (d) | 12. (a) | 13. (a) | 14. (b) | 15. (b) |
| 16. (d) | 17. (b) | 18. (b) | 19. (c) | 20. (a) |
| 21. (b) | 22. (b) | 23. (d) | 24. (d) | 25. (c) |





NEET

Class-12

FOUNDATION

Maximise your chance of success in NEET by reading this article. This section is specially designed to optimise your preparation by practising more and more. It is a unit wise series having chapterwise question bank, allowing you to prepare systematically and become more competent.

- Recall question or single concept question – indicated by a single finger.
- Application question or question which requires 2 or 3 concepts - indicated by 2 fingers.
- Application question or question which requires 3 or more concepts - indicated by 3 fingers.

UNIT-VIII : BIOLOGY IN HUMAN WELFARE

CHAPTER-8 : HUMAN HEALTH AND DISEASES

Multiple Choice Questions

1. The causal organism of yellow fever is
 (a) Paramyxovirus (b) Rubeola virus
 (c) Flavivirus (d) Rubella virus.
2. ELISA cannot be used to detect
 (a) AIDS (b) hepatitis C
 (c) tuberculosis (d) hepatitis B.
3. Which of the following statements is not correct regarding cancer?
 (a) Carcinogens can transform normal cells into cancerous neoplastic cells.
 (b) Benign tumor remains confined to the site of its origin.
 (c) Metastasis is also known as "stage 3 cancer".
 (d) α -interferon, a biological response modifier is given to cancer patients.
4. In Severe Combined Immunodeficiency Disease (SCID), patient is
 (a) without B-cells in due course of time
 (b) with B-cells but without T-cells in due course of time
 (c) without B-cells and T-cells from birth
 (d) with B-cells and without T-cells from birth.
5. The allergic reaction that involves all the tissues of the body and occurs in a few minutes after the injection of an antigen is called
 (a) sensitisation (b) hay fever
 (c) allergic asthma (d) anaphylaxis.
6. LSD is a/an
 (a) synthetic hallucinogen
 (b) opioid
 (c) natural hallucinogen
 (d) angel dust.
7. X is a disease caused in alcoholic patient due to the deficiency of thiamine. It is characterised by mental disturbances, paralysis of eye movements and ataxia of gait. X is most likely to be
 (a) Mallory-Weiss syndrome
 (b) Korsakoff's syndrome
 (c) Wernicke's syndrome
 (d) Alcoholic cirrhosis.
8. The correct order of stages in HIV infection is
 (a) Replication of viral DNA → Viral DNA incorporated into host genome → Replication of viral DNA → Macrophages produce new viruses
 (b) RNA of the virus forms DNA through reverse transcriptase → Viral DNA incorporates into host genome → Replication of viral DNA → Infected cells produce new viruses
 (c) RNA genome of the virus replicates → Viral RNA incorporates into host genome → Replication of viral RNA → Infected cells produce new viruses
 (d) Replication of viral DNA → Viral DNA incorporated into host genome → DNA of the virus transcribes to RNA → Replication of viral RNA → Macrophages produce new viruses.

9. In an antibody,
- heavy chains have more number of amino acids than light chains
 - heavy chains have less number of amino acids than light chains
 - both heavy and light chains have similar number of amino acids
 - light chains do not have any amino acid.
10. In humoral immunity, memory B-cells live for
- only one week
 - only few days
 - a long span in an active state
 - a long span in a dormant state until activated by a new infection.

Match The Columns

11. Match Column I with Column II.

Column I	Column II
A. <i>Trichophyton</i>	(i) Mantoux test
B. Ascariasis	(ii) Enteritis
C. Tuberculosis	(iii) Pig
D. <i>Entamoeba histolytica</i>	(iv) Ringworm
E. Taeniasis	(v) Nematode

12. Match Column I with Column II (There can be more than one match for items in Column I).

Column I	Column II
A. Opium	(i) Reduce intermittent awakening
B. Barbiturate	(ii) Lysergic acid diethylamide
C. Benzodiazepine	(iii) <i>Papaver somniferum</i>
D. Hallucinogens	(iv) Cause skeletal muscle relaxation
E. Nicotine	(v) Stimulates release of adrenaline
	(vi) Analgesic
	(vii) Sedative
	(viii) Major stimulatory tobacco component
	(ix) Cannabinoids
	(x) Phenobarbitone

Passage Based Question

13. Complete the given passage with appropriate words or phrases.
- In human beings, malaria is caused by four species of (i). (ii) is most common in India among these four species. It causes (iii) malaria. Recurrent attacks of fever during malaria is called (iv). Malignant tertian malaria is caused by (v) which is common in certain parts of India and most parts of Africa and else where in tropics. Quartan malaria is caused by (vi) and Mild tertian malaria is caused by (vii). The primary host of malarial parasite is (viii) and the secondary hosts are (ix). The oldest drug for the treatment of malaria is (x).

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

- if both A and R are true and R is the correct explanation of A
- if both A and R are true but R is not the correct explanation of A
- if A is true but R is false
- if both A and R are false.

14. **Assertion :** In autoimmunity, the immune system fails to recognise body's own proteins and starts destroying them.

Reason : Functions of helper T-cells are increased and suppressor T-cells are decreased.

15. **Assertion :** Antigens combine with the antibodies showing a lock and key analogy.

Reason : Each antibody molecule has at least two binding sites that can attach to a specific epitope on an antigen.

16. **Assertion :** The virus of dengue fever is transmitted by the bite of *Aedes aegypti*.

Reason : *Aedes* mosquito breeds in clean water and bites only during daytime.

17. **Assertion :** Diabetes mellitus is the most common endocrine disorder of the pancreas.

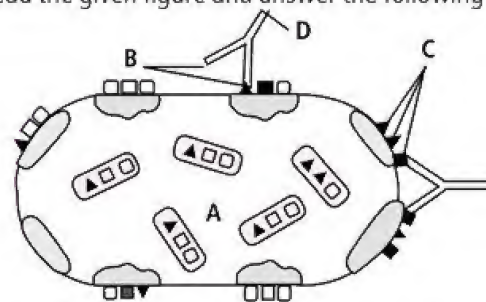
Reason : Insulin-dependent diabetes mellitus is caused by failure of the pancreatic α -cells to produce adequate amount of insulin.

18. **Assertion :** AIDS is a communicable disorder of cell mediated immune system of the body.

Reason : AIDS cannot be acquired by sharing utilities, coughing and sneezing, shaking hands and insect bites.

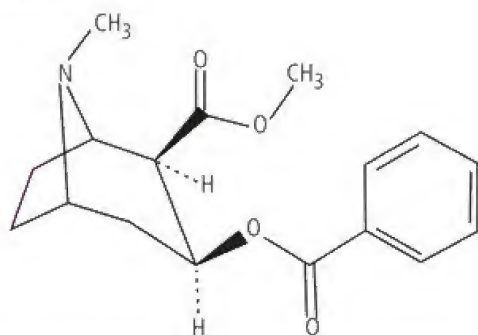
Figure Based Questions

19. Read the given figure and answer the following questions.



- Identify the labelled parts as A, B, C and D in the given figure.
- What is the function of B?
- What exactly happens after the binding of D with A?
- What are the different types of A found in ABO blood groups?

20. Carefully observe the given figure and answer the following questions.



- Identify the compound having the given structure.
- What is the chemical nature and origin of the given compound?
- What are the major effects of the given compound?
- Write the chemical formula of it.

CHAPTER-9 : STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

Multiple Choice Questions

- Plymouth Rock is a/an
 - Asiatic breed of chicken
 - American breed of chicken
 - English breed of cow
 - Mediterranean breed of chicken.
- Select the mismatched pair.

(a) Ranikhet disease	– Paramyxovirus
(b) Kathiawari	– Indian horse breed
(c) Lohi	– Exotic goat breed
(d) Mad cow disease	– Prion
- Select the correct statement.
 - Crossing is the mating of animals within the same breed having a common ancestor on male side of the pedigree up to 4-6 generations.
 - When breeding is between animals of the different breeds for 4-6 generations, it is called inbreeding.
 - Male and female animals of two different species are mated in interspecific hybridisation.
 - In cross-breeding superior females of one breed are mated with superior males of another breed.
- Rock bee is

(a) <i>Apis mellifera</i>	(b) <i>Apis indica</i>
(c) <i>Apis dorsata</i>	(d) <i>Apis florea</i> .
- Read the following statements and select the correct ones.
 - Aquaculture involves production of all types of marine and freshwater fishes.
 - Hilsa migrates from river to sea for breeding during monsoon.

- Fish feed is provided from outside in pisciculture.
 - The gill rot of carps is a fungal disease.
- (i) and (iii)
 - (i) and (iv)
 - (ii) and (iv)
 - (iii) and (iv)

- Select the incorrect one from the given statements.
 - Germplasm is the sum total of all the alleles of the genes present in a crop and its related species.
 - Improved varieties of a crop species that are no more in cultivation are not included in germplasm collection.
 - A proper germplasm collection is essential for a successful breeding programme.
 - Germplasm is evaluated to identify plants with desirable combination of characters.
- Two species are hybridised followed by doubling of chromosomes. This is termed as
 - allopolyploidy
 - autopolyploidy
 - autoallopolyploidy
 - mutation breeding.
- Select the correct sequence of steps in callus culture method.
 - Explant → Cell biomass production → Subculturing → Callus formation
 - Explant → Callus formation → Subculturing → Cell biomass production
 - Callus formation → Explant → Subculturing → Cell biomass production
 - Callus formation → Subculturing → Cell biomass production → Explant
- The genetically identical plants developed from any part of a plant by tissue culture/micropropagation are called
 - haploids
 - somaclones
 - transgenic plants
 - explants.
- The insect resistance variety of *Brassica* is
 - Pusa A-4
 - Pusa Swarnim
 - Pusa Komal
 - Pusa Gaurav.

Match The Columns

11. Match Column I with Column II.

Column I	Column II
A. Sonora 64	(i) Flat bean
B. Pusa Sadabahar	(ii) Rice
C. Taichung Native-I	(iii) Wheat
D. Pusa Shubhra	(iv) Chilli
E. Pusa Sem 3	(v) Cauliflower

12. Match Column I with Column II (There can be more than one match for items in Column I).

Column I	Column II
A. Malvi	(i) Bacterial disease
B. Sahiwal	(ii) Draught breed
C. Bird flu	(iii) Milch breed
D. Anthrax	(iv) Gobi desert
E. <i>Camelus bactrianus</i>	(v) Rajasthan
	(vi) H5N1
	(vii) Punjab
	(viii) Viral disease
	(ix) <i>Bacillus anthracis</i>
	(x) Two humps

Passage Based Question

13. Complete the given passage with appropriate words or phrases.

Honey bees are reared in wooden boxes having a large (i) with an opening for entry and exit of bees. A number of frames coated with (ii) sheets having (iii) imprints are vertically placed in the chamber. Each wax sheet known as (iv) provides foundation arc for bees to build combs. A chamber called (v) is placed over (i). It has additional similar frames for more comb foundations. A (vi) queen is inducted into the (i). When sufficient honey has been stored, combs are removed and (vii) to extract honey.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

- (a) if both A and R are true and R is the correct explanation of A
 (b) if both A and R are true but R is not the correct explanation of A
 (c) if A is true but R is false
 (d) if both A and R are false.

14. **Assertion :** Polyploids with odd number of genomes are sexually sterile.

Reason : Odd chromosomes cannot form synapsis during meiosis.

15. **Assertion :** In nature, haploid plants originate from unfertilised egg cells.

Reason : When anthers of some plants are cultured on a suitable medium to produce haploid plants, it is called anther culture.

16. **Assertion :** In a bee hive, queen cells are of different sizes than the worker cells and drone cells.

Reason : Queen bee fed on royal jelly is larger than the worker and drone bees.

17. **Assertion :** Continuous inbreeding reduces fertility and even productivity.

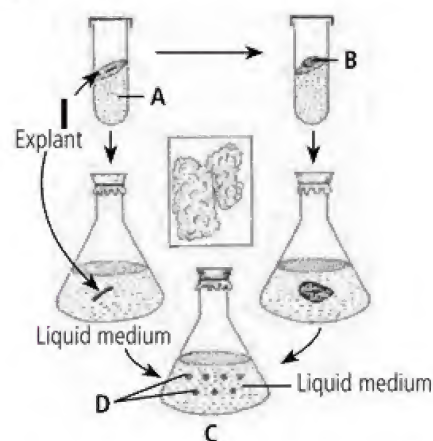
Reason : MOET is an inbreeding method.

18. **Assertion :** *Calta catla*, *Labeo rohita* and *Cirrhina mrigala* are cultured in same pond in fish farming.

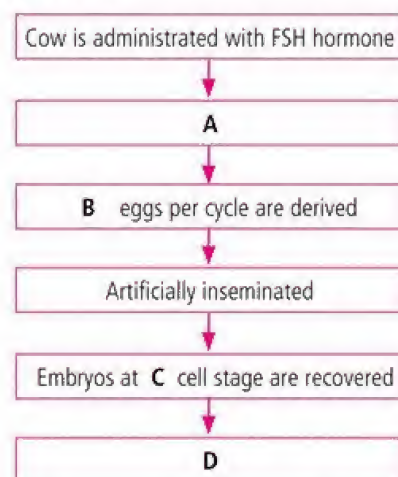
Reason : Surface feeder, column feeder and bottom feeder fish are used in composite farming.

Figure Based Questions

19. Carefully study the given figure and answer the following questions.



- (a) Identify the labelled structures A, B, C and D.
 (b) Define B.
 (c) Why subculturing is necessary for this process?
 (d) Which growth regulator is used for C?
20. Study the given flow chart carefully and answer the following questions.



- (a) Identify the events that take place at stages A and D respectively.
 (b) State the values of B and C.
 (c) What is the name of the technology illustrated by the given flow chart?
 (d) State the significance of this technology.

CHAPTER-10 : MICROBES IN HUMAN WELFARE

Multiple Choice Questions

1. Which is incorrect among the given statements?
 (a) Hard cheese contains less than 40% water.
 (b) Cheese culture consists up of *Lactobacillus*, *Acetobacter*, *Saccharomyces*, *Rhizopus* and *Amylomyces*.
 (c) Cottage cheese is prepared by double step fermentation.
 (d) Swiss cheese is ripened with the help of CO₂ producing bacterium called *Propionibacterium shermanii*.

2. Brandy contains
 (a) 95% alcohol (b) 98% alcohol
 (c) 60-70% alcohol (d) 40% alcohol.

3. Study the given table and correctly identify P, Q, R and S.

Enzyme	Source	Function
Pectinase	P	Retting of fibres
Q	<i>Streptococcus</i>	Fibrinolytic effect
Protease	<i>Mortierella renispora</i>	R
Lactase	S	Prevents sandiness in ice-cream

- | P | Q | R | S |
|--------------------------------|----------------|--------------------|-------------------------------|
| (a) <i>Byssoschlamys fulvo</i> | Strepto-kinase | Chill proofing | <i>Saccharomyces fragilis</i> |
| (b) <i>Geotrichum candidum</i> | Lipase | Softening of bread | <i>Rhizopus</i> |
| (c) <i>Aspergillus</i> sp. | Amylase | Remove oil stains | <i>Mucor</i> |
| (d) <i>Torula cremoris</i> | Lipase | Clot buster | <i>Bacillus</i> sp. |

4. Which acid is obtained through the fermentation carried out by *Aspergillus niger* and *Mucor* species on sugary syrups?
 (a) Acetic acid (b) Citric acid
 (c) Lactic acid (d) Butyric acid

5. Find out the mismatched pair.
 (a) Rennet — *Mucor*
 (b) Lactase — *Torula cremoris*
 (c) Pectinase — *Candida lipolytica*
 (d) Amylase — *Aspergillus*

6. The common antibiotic obtained from lichen is
 (a) patulin (b) usnic acid
 (c) citrinin (d) clavacin.

7. Spores of *Bacillus thuringiensis* possess Cry protein which is
 (a) fungicidal (b) herbicidal
 (c) insecticidal (d) bactericidal.

8. A blue-green algae used for production of single cell protein is
 (a) *Oscillatoria* (b) *Fucus*
 (c) *Spirogyra* (d) *Spirulina*.

9. Amount of CO₂ in biogas is
 (a) 30 - 40% (b) 50 - 60%
 (c) 60 - 80% (d) less than 5%.

10. Read the given statements carefully and select the correct option.
 (i) *Azospirillum* bacteria live around the roots of higher plants without developing any intimate relationship.
 (ii) Biofertilisers are not effective under semi-arid conditions.
 (iii) Cyanobacteria are extremely low cost biofertilisers.
 (iv) Biopesticides are pest specific and are harmless to other organisms.
 (a) (i) and (ii) are correct.
 (b) Only (iii) is correct.
 (c) (i) and (iii) are incorrect.
 (d) Only (ii) is incorrect.

Match The Columns

11. Match Column I with Column II.

Column I	Column II
A. Tofu	(i) Pickled cabbage
B. Sauerkraut	(ii) SCP
C. Sour cream	(iii) <i>Streptococcus thermophilus</i>
D. Yoghurt	(iv) <i>Streptococcus lactis</i>
E. Yeast	(v) Soybean

12. Match Column I with Column II. (There can be more than one match for items in Column I)

Column I	Column II
A. <i>Azolla</i>	(i) Rhizosphere association
B. <i>Rhodospirillum</i>	(ii) Symbiotic nitrogen fixing bacteria
C. <i>Azospirillum</i>	(iii) Vesicular-arbuscular mycorrhiza
D. <i>Rhizobium</i>	(iv) Associative mutualism
E. <i>Glomus</i>	(v) Photoautotrophic bacteria
	(vi) Arbuscules
	(vii) <i>Anabaena</i>
	(viii) Free living nitrogen fixing bacteria
	(ix) Leghaemoglobin
	(x) Rice plant

Passage Based Question

13. Complete the given passage with appropriate words or phrases.
 Fermentative activity of microbes is used industrially to obtain a number of products. For any new industrial utilisation of a microbial activity, the technology passes through three stages—laboratory scale, pilot plant scale and (i). The development from laboratory scale to (i) is called (ii). Laboratory scale uses (iii) for fermentation

whereas pilot plant scale uses metallic container called (iv). Microorganisms are added in (iv) in three ways : (a) (v) growth system, (b) (vi) growth system and (vii) growth system.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

(a) if both A and R are true and R is the correct explanation of A
(b) if both A and R are true but R is not the correct explanation of A

(c) if A is true but R is false

(d) if both A and R are false.

14. **Assertion :** Pathogenic strains of bacteria often develop resistance to existing antibiotics.

Reason : The resistance producing extra-chromosomal genes are present in plasmid and can pass from one bacterium to another.

15. **Assertion :** Antibiotics like cephalosporin and bacitracin inhibit bacterial growth by disrupting their wall synthesis.

Reason : Antibiotics like polymyxin and nystatin inhibit bacterial growth by inhibiting their 50S ribosome function.

16. **Assertion :** A small part of activated sludge is used as inoculum in aeration tank.

Reason : Activated sludge contains a number of aerobic heterotrophic microbes.

17. **Assertion :** Probiotic curd is supplemented with probiotic culture of *Bifidobacterium*.

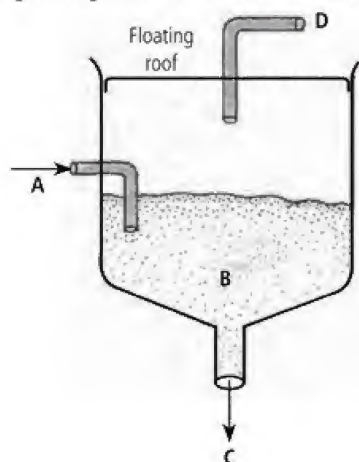
Reason : Previously *Bifidobacterium* were referred to as *Lactobacillus bifidus*.

18. **Assertion :** Smoother crops secrete certain chemicals which do not allow weeds to grow nearby.

Reason : Alfalfa, sunflower, rye, etc., are some smoother crops.

Figure Based Questions

19. Refer to the given figure and answer the following questions.



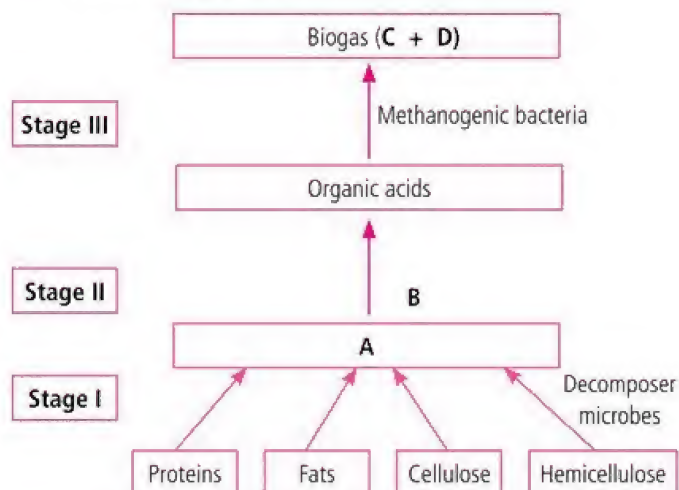
(a) Identify the given figure.

(b) Identify A, B, C and D in the given figure.

(c) What is the use of C?

(d) What is the function of methanogenic bacteria in this process?

20. Study the given flow chart of biogas formation and answer the following questions.



(a) Identify A, B, C and D in the given flow chart.

(b) What is the percentage of C and D in biogas?

(c) What is the another name of biogas? State few of its uses.

SOLUTIONS

CHAPTER-8 : HUMAN HEALTH AND DISEASES

1. (c) 2. (c) 3. (c) 4. (c) 5. (d)
6. (c) 7. (c) 8. (b) 9. (a) 10. (d)
11. A-(iv), B-(v), C-(i), D-(ii), E-(iii)
12. A-(iii, vi), B-(vii, x), C-(i, iv), D-(ii, ix), E-(v, viii)
13. (i) *Plasmodium* (ii) *Plasmodium vivax*
 (iii) Benign tertian (iv) paroxysms
 (v) *Plasmodium falciparum* (vi) *Plasmodium malariae*
 (vii) *Plasmodium ovale*
 (viii) female *Anopheles* mosquito
 (ix) human beings (x) quinine
14. (a) 15. (b) 16. (b) 17. (c) 18. (b)
19. (a) A-Antigen, B-Binding sites, C-Epitopes, D-Antibody
 (b) Each antibody molecule has at least two binding sites (B) that can recognise and attach to the specific epitopes on an antigen.
 (c) After the binding of antigen with antibody, an antigen-antibody complex is formed. This complex is then transported to cellular system where it can be destroyed or deactivated.
 (d) Antigen - A, B and AB
20. (a) Morphine
 (b) Morphine is the active principal alkaloid of opium. It is obtained from the latex of *Papaver somniferum*.
 (c) Morphine has strong analgesic effect as it can bind to specific receptors in central nervous system and relieves pain. It also depresses respiratory centre and contributes to the fall in blood pressure. It can cause bradycardia.
 (d) $C_{17}H_{19}NO_3$

CHAPTER-9 : STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

1. (b) 2. (c) 3. (a, d) 4. (c) 5. (d)
6. (b) 7. (a) 8. (b) 9. (b) 10. (d)
11. A-(iii), B-(iv), C-(ii), D-(v), E-(i)
12. A-(ii, v), B-(iii, vii), C-(vi, viii), D-(i, ix), E-(iv, x)
13. (i) brood chamber (ii) wax
 (iii) hexagonal (iv) comb foundation
 (v) super (vi) gravid
 (vii) centrifuged
14. (a) 15. (b) 16. (a) 17. (c) 18. (a)
19. (a) A-Agar medium, B-Callus, C-Suspension culture, D-Cell clumps
 (b) Callus is irregular, unorganised and undifferentiated mass of actively dividing cells.
 (c) If tissue cultures are kept in the same culture vessel, they die in course of time due to depletion of nutrients from the media. Therefore, regular transfer into new culture vessels is necessary.

- (d) Auxin (2, 4-D)
20. (a) Stage A - Follicular maturation and superovulation
 Stage D - Embryos are transferred to surrogate mother
 (b) B - 6-8, C - 8-32
 (c) Multiple Ovulation Embryo Transfer Technology (MOET)
 (d) MOET is a controlled breeding programme for herd size improvement in a short time. This technology has been demonstrated for cattle, sheep, rabbits, buffaloes, mares, etc.

CHAPTER-10 : MICROBES IN HUMAN WELFARE

1. (c) 2. (c) 3. (a) 4. (b) 5. (c)
6. (b) 7. (c) 8. (d) 9. (a) 10. (d)
11. A-(v), B-(i), C-(iv), D-(iii), E-(ii)
12. A-(vii, x), B-(v, viii), C-(i, iv), D-(ii, ix), E-(iii, vi)
13. (i) manufacturing unit (ii) scaling up
 (iii) glass vessel (iv) bioreactor
 (v) support (vi) suspended
 (vii) column
14. (a) 15. (c) 16. (a) 17. (b) 18. (b)
19. (a) The given figure is of anaerobic sludge digester.
 (b) A-Sludge inlet, B-Sludge, C-Spent sludge, D-Methane vent
 (c) Spent sludge from the anaerobic sludge digester can be used as manure or part of compost.
 (d) Methanogenic bacteria digest the activated sludge and produce marsh gas which is a mixture of methane, H_2S and CO_2 .
20. (a) A-Soluble compounds or monomers, B-Fermentative microbes, C-Methane, D- CO_2
 (b) C - 50-70%, D - 30-40%
 (c) Another name of biogas is gobar gas. Biogas provides both storable form of energy and manure. It does not add to pollution. It minimises the chances of spread of faecal pathogens.



UNSCRAMBLED WORDS

DECEMBER 2017

- | | |
|-------------------|-------------------|
| 1-h- OSSEIN | 2-d- OXYTOCIN |
| 3-g- VELAMEN | 4-j- CYPRAEA |
| 5-i- ACAULESCENT | 6-b- DRYOPITHECUS |
| 7-a- RHIZOMORPHS | 8-c- OCHREATE |
| 9-e- AZADIRACHTIN | 10-f- CRETINISM |

Winners : Parijat Sinha (West Bengal), Sarthak Garg (Uttar Pradesh), Ananya P Bhagra (Himachal Pradesh), Pinky Chauhan (Uttar Pradesh), Kumar Hussain Malik (Kashmir)

CBSSE

BOARD

PRACTICE PAPER 2018



GENERAL INSTRUCTIONS

- All questions are compulsory.
- This question paper consists of five sections A, B, C, D and E. Section A contains 5 questions of one mark each, Section B contains 5 questions of two marks each, Section C contains 12 questions of three marks each, Section D contains 1 question of VBQ type with four marks and Section E contains 3 questions of five marks each.
- There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.
- Wherever necessary, the diagrams drawn should be neat and properly labelled.

Time Allowed : 3 hours

Maximum Marks : 70

SECTION - A

- What is the role of filiform apparatus in embryo sac?
- Arrange the following primates in increasing order of brain capacity.
Neanderthal man, *Homo habilis*, *Homo erectus*
- Mention two basic amino acids present in histones.
- Mother's milk is considered very essential for the new born infant. Why?
- Suggest a technique to a researcher who has cut DNA into fragments by restriction enzyme and now needs to separate them.

SECTION - B

- How does pollination take place in cleistogamous flowers?
- Draw a sketch of a transcription unit.

OR

What is the role of coelacanth in evolution?

- What is the source of statins? Mention the action of statins.
- Identify 'A', 'B', 'C', 'D' in the given table.

Crop	Variety	Insect pests
A	Pusa Gaurav	B
Flat bean	C	Jassids
Okra	Pusa A-4	D

- Give an example of following types of interactions -
(a) Commensalism (b) Mutualism

SECTION - C

- What is placenta? How does it act as an endocrine gland during pregnancy?
- Diagrammatically represent the process of transcription in bacteria.
- Briefly explain any two chromosomal disorders in human.
- What is parthenocarpy? How does parthenocarpy differ from agamospermy?
- Define biogeography. How do Darwin's finches provide the biogeographical evidence in favour of evolution?
- How has MOET programme resulted in herd improvement?

OR

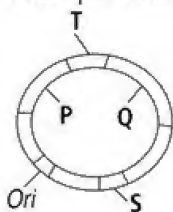
Mention some special techniques which can assist infertile couples to have children. Why test tube baby technique is called IVF?

- Explain the role of baculoviruses as biological control agents. Describe their role in integrated pest management programmes.
- Name the type of immunity that is present at the time of birth in human. Explain any three ways by which it is accomplished.
- Explain how gene therapy has cured adenosine deaminase (ADA) deficiency in humans.

20. Refer to the given diagram of *E. coli* cloning vector pBR322.

Answer the following questions:

- Indicate the antibiotic resistant genes. State the role of these genes.
- Indicate restriction site of *Eco*RI.
- Indicate the gene involved in the replication of plasmid.



- Explain any three methods to force 'alien' or recombinant DNA into host cells.
- List and explain the factors due to which the density of a population in a given habitat during a given period fluctuates.

SECTION - D

- The air quality of your city has significantly improved now in comparison to what existed few years back. This is the result of a lot of conscious human efforts. You are being asked to conduct an awareness programme in your locality wherein you will comment on the steps taken by local Government to improve the air quality.
 - Write any two of your comments.
 - List any two ways that you would include in your programme so as to ensure the maintenance of good quality of air.
 - State any two values which your programme will inculcate in the people of your locality.

SECTION - E

- A flower of brinjal plant following the process of sexual reproduction produces 360 viable seeds. Answer the following questions giving reasons:
 - How many ovules are minimally involved?
 - How many megaspore mother cells are involved?
 - What is the minimum number of pollen grains that must land on stigma for pollination?
 - How many male gametes are involved in the above case?
 - How many microspore mother cells must have undergone reduction division prior to dehiscence of anther in the above case?

OR

- Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.
 - Why is follicular phase in the menstrual cycle also referred to as proliferative phase? Explain.
 - Explain the events that occur in a Graafian follicle at the time of ovulation and thereafter.
 - Draw diagram of Graafian follicle and label antrum and secondary oocyte.
- Describe Meselson and Stahl's experiment that was conducted on *E. coli* in 1958.

OR

- Differentiate between homology and analogy giving one example each of plant and animal, respectively.
 - Briefly explain how are they considered as an evidence in support of evolution.
- Name the population growth pattern represented by the equation $\left\{ \frac{dN}{dt} = rN \right\}$. What does "r" represent in the equation? Write its importance in population growth.
 - By using population Verhulst-Pearl logistic growth curve explain the principle of carrying capacity.

OR

- Explain how a hydrarch succession progresses from hydric to mesic condition and forms a stable climax community.
- Why is the rate of secondary succession faster than that of primary succession?

SOLUTIONS

- Filiform apparatus of synergids plays a role in pollen tube guidance and pollen tube reception.
- Homo habilis* < *Homo erectus* < Neanderthal man
- Lysine and Arginine
- Mother's milk contains antibodies which protect the infant against infections. The yellowish fluid, colostrum secreted by the mother during the initial days of lactation has abundant antibodies (IgA).
- Separation of DNA fragments can be done by agarose gel electrophoresis. In this technique, the DNA molecules are separated according to their size, under the influence of an electric field.
- Cleistogamous flowers do not open at all. In such flowers, the anthers and stigma lie close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma and pollination takes place.

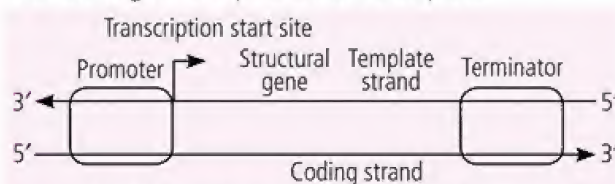


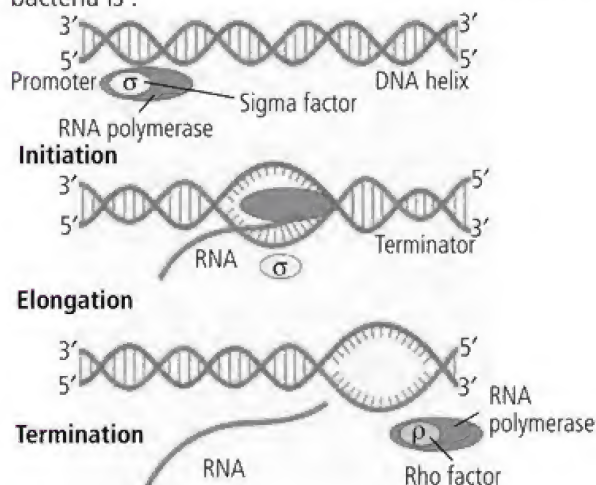
Fig.: Schematic structure of a transcription unit

OR

- Coelacanth is the oldest among living fishes and is considered a connecting link between fishes and amphibians that live on both land and water.
- Statins are blood-cholesterol lowering agents commercially produced by the yeast *Monascus purpureus*. Statins act by competitively inhibiting the enzyme responsible for synthesis of cholesterol.
 - In the given table, A is *Brassica*, B is Aphids, C is Pusa Sem 2 and D is Shoot and fruit borer.

10. (a) Association of sucker fish and shark is an example of commensalism where one individual is benefitted while the other remains unaffected. Sucker fish attaches itself to the under surface of shark by its holdfast and gets free ride, wide dispersal, protection and food.
- (b) Mycorrhizae, association between fungi and the roots of higher plants is an example of mutualism. It is a type of interaction where both partners are benefitted with none of the two capable of living separately.
11. The intimate connection between developing fetus and uterine wall of mother to exchange the materials is called placenta. The chorionic villi and uterine tissue become interdigitated with each other and jointly form the placenta. Placenta acts as an endocrine gland as it secretes a number of hormones such as estrogen, progesterone, human chorionic gonadotropin, human chorionic somatomammotropin, chorionic thyrotropin, chorionic corticotropin and relaxin.

12. Diagrammatic representation of process of transcription in bacteria is :



13. Two chromosomal disorders in humans are : Down's syndrome and Klinefelter's syndrome. Down's syndrome is an autosomal aneuploidy that occurs due to trisomy of 21st chromosome. The affected person has rounded face, protruding tongue, folded eyelids, flat hands, stubby fingers, broad palm with palmer crease, short and broad neck, low IQ. Klinefelter's syndrome (XXY) is caused by presence of extra X-chromosome due to union of nondisjunct XX egg and a normal Y sperm or normal X egg and abnormal XY sperm *i.e.*, it is trisomy of sex(X) chromosome. These are genetically sterile male individuals with underdeveloped testes, gynaecomastia, etc.
14. Development of fruits without fertilisation is called parthenocarpy, *i.e.*, the phenomenon of development of ovary into fruit without the act of fertilisation. The parthenocarpic fruits are seedless, *e.g.*, banana, guava, apple, pineapple, etc. Parthenocarpy can be induced artificially by :
(i) Spraying auxins and gibberellins (ii) Low temperature
In agamospermy, embryo and seeds are produced asexually

without involvement of fertilisation and meiosis.

15. Biogeography is the study of patterns of geographical distribution of plants and animals across earth and the changes in those distributions over time. Darwin's finches of Galapagos islands illustrate adaptive radiation. They differ in size and shape of beak as they have adapted themselves according to the availability of food in that island.
16. Multiple Ovulation Embryo Transfer Technology (MOET) is a revolutionary technique for herd improvement. In this technique, a cow is administered with hormones of FSH like activity, to induce follicular maturation and super ovulation, *i.e.*, instead of one egg, which they usually give per cycle, they produce 6-8 eggs. The cow is either mated with the best bull or artificially inseminated. The embryos at 8-32 cell stages are then recovered and transferred to surrogate mothers. The genetic mother is again available for another super ovulation.

OR

Assisted reproductive technologies (ART) include a number of special techniques which assist infertile couples to have children. Some important techniques of ART are (i) Test tube baby (IVF, ICSI) (ii) Artificial insemination technique (AIT) and (iii) Gamete intra Fallopian transfer (GIFT). In test tube baby technique, the fusion of ovum and sperm is done outside the body of woman and induced to form zygote in the laboratory. The zygote is then allowed to develop early embryo which is then implanted in uterus. So, this method is referred to as *in vitro* fertilisation (IVF).

17. Baculoviruses infect the larval stages of many harmful insects such as ants, wasps and beetles. These viruses are excellent candidates for species-specific, narrow spectrum insecticidal applications. They have been shown to have no negative impacts on plants, mammals, birds, fish or even on non-target insects. This is very desirable when beneficial insects are been conserved to aid in overall integrated pest management (IPM) programme.
18. Innate immunity is present at the time of birth. It consists of different types of barriers :
(i) Physical barriers : Skin on our body prevents entry of microorganisms. Mucus coating of the epithelium

MPP-10 CLASS XI

ANSWER

KEY

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (a) | 2. (d) | 3. (b) | 4. (c) | 5. (d) |
| 6. (c) | 7. (a) | 8. (b) | 9. (d) | 10. (d) |
| 11. (c) | 12. (c) | 13. (a) | 14. (d) | 15. (a) |
| 16. (c) | 17. (c) | 18. (b) | 19. (c) | 20. (c) |
| 21. (b) | 22. (b) | 23. (a) | 24. (c) | 25. (d) |
| 26. (b) | 27. (b) | 28. (b) | 29. (b) | 30. (c) |
| 31. (b) | 32. (b) | 33. (b) | 34. (a) | 35. (c) |
| 36. (c) | 37. (c) | 38. (d) | 39. (b) | 40. (c) |

lining the respiratory, gastrointestinal and urinogenital tracts trap microbes entering our body.

- (ii) Physiological barriers : Acid in the stomach, saliva in the mouth, tears from eyes – all prevent microbial growth.
- (iii) Cytokine barriers : Virus-infected cells secrete proteins called interferons which protect non-infected cell, from further viral infection.

19. ADA enzyme is crucial for the functioning of immune system. ADA deficiency can lead to severe combined immune deficiency (SCID). This disorder is caused due to the deletion of the gene for adenosine deaminase. As a first step, lymphocytes from the bone marrow of the patient are grown in a culture outside the body. A functional ADA, cDNA is introduced into these lymphocytes which are subsequently returned to the patient. As these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes.

20. (a) P and Q represent antibiotic resistant genes. These are considered useful for selectable markers.

(b) T represents restriction site of *EcoRI*.

(c) S represents *rop* genes involved in the replication of plasmid.

21. The three methods which force 'alien' or recombinant DNA into host cells are: electroporation, CaCl_2 treatment and microinjection.

Electroporation : In this method, electrical impulses induce transient pores in the host cell membrane through which the DNA molecules are incorporated into the host cells.

CaCl_2 treatment: Treating cells with a specific concentration of divalent cations, such as calcium cell increases the efficiency with which DNA enters the cell through pores in its cell wall. Recombinant DNA (rDNA) can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42°C (heat shock), and then putting them back on ice. This enables the cells to take up the recombinant DNA.

Microinjection : It is the introduction of foreign gene into plant cell or animal cell by using microneedles or micropipettes.

22. The density of a population in a given habitat during a given period fluctuates due to changes in four basic processes :

- (i) **Natality** - It refers to the number of births during a given period in the population.
- (ii) **Mortality** - It refers to the number of deaths in the population during a given period.
- (iii) **Immigration** - It refers to the number of individuals of the same species that have come into the habitat from elsewhere during a time period under consideration.
- (iv) **Emigration** - It refers to the number of individuals of the population who left the habitat and went elsewhere during a time period.

23. (a) (i) It was necessary and a very effective step taken by the local Government to switch over the entire fleet of public transport to compressed natural gas (CNG) as CNG causes less pollution in comparison to petrol or diesel.

(ii) Compulsory regular checkup of pollution emission by vehicles also add to reduction in vehicular air pollution.

(b) (i) Use of unleaded petrol, low-sulphur petrol/diesel must be insisted.

(ii) More use of public transport instead of private transport.

(c) The two values that the programme will inculcate in the people of locality are:

(i) Cooperation and sharing of vehicles to reduce vehicular air pollution, e.g., car pooling.

(ii) Awareness about the extent of environmental pollution by automobiles.

24. Refer to answer 185, page no. 44, MTG CBSE Champion.

OR

Refer to answer 98, page no. 73, MTG CBSE Champion.

25. Refer to answer 85, page no. 173, MTG CBSE Champion.

OR

Refer to answer 59, page no. 210, MTG CBSE Champion.

26. (a) Refer to answer 110 (a), page no. 349, MTG CBSE Champion.

(b) Refer to answer 105, page no. 348, MTG CBSE Champion.

OR

Refer to answer 65, page no. 368, MTG CBSE Champion.



Contributed by : Nidhi Raina (Bengaluru), Dipankar Saha (West Bengal)

SOLUTIONS TO DECEMBER 2017 CROSSWORD

¹ E	N	D	O	G	A	M	Y		² P	³ P				⁴ P	
⁵ C	⁶ L	⁷ N	I	C	H	E			⁸ E	R	G	⁹ O	T	O	
O	A		¹⁰ F	L	¹¹ E	X	O	R	A	I		P		L	
R	B					X				T	C		H	¹² L	Y
T	R			¹³ E	O	S	I	N			K		I	Y	E
E	U		¹⁴ B	E	N	T	H	O	S	L			O	C	M
X	M	¹⁵ G	L	O	T	T	I	S		E			P	O	B
¹⁶ P		¹⁷ A	L	L	O	X	A	N		S			L	P	R
U	¹⁸ K				¹⁹ S	Q	U	I	L	L		²⁰ S	U	E	Y
L	E	²¹ A	L	G	I	N	²² E		²³ H			M	T	N	O
S	Y	²⁴ L	O	C	U	S	Q		I			U	E	E	N
E	²⁵ C	U	R	I	N	G	U	²⁶ G	N			T	U		Y
²⁷ S	E	T	A	E				U	O	N			S		
	²⁸ B	O	R	O	N			S	U	Y	²⁹ R	E	M	A	K
³⁰ C	O	L	L	A	G	E	N	T							

MPP-10

MONTHLY Practice Problems

Class XII

This specially designed column enables students to self analyse their extent of understanding of specified chapters. Give yourself four marks for correct answer and deduct one mark for wrong answer. Self check table given at the end will help you to check your readiness.

• Environmental Issues

Total Marks : 160

Time Taken : 40 Min.

1. Select the option which correctly fills the blanks.
When polyblend is mixed with (i), it enhances the (ii) and helps to increase the road life by a factor of (iii).

(i)	(ii)	(iii)
(a) plastic	water repellant properties	three
(b) bitumen	smoothness	five
(c) cement	frictional force	two
(d) bitumen	water repellant properties	three

2. Refer to the given figure and select the correct option regarding it.



- (a) It is the most widely used device which separate the particulate matter on the basis of their charges.
(b) In this, dust-laden fumes are passed through the filtering devices formed of porous mats of polyester.
(c) It is formed of dry or wet packing material and is used to separate dust and SO_2 from air.
(d) All of these
3. Choose the incorrect statement.
(a) Electrostatic precipitators remove 99% of particulates present in industrial and thermal plant exhausts.
(b) Smog causes glazing and necrosis in plants.
(c) CNG is costly than diesel but cheaper than petrol.
(d) SO_2 , above 1ppm, causes irritation to eyes and injury to respiratory tract.

4. Select the incorrect pair.

(a) Mercury	—	Minamata
(b) Cobalt	—	Itai-Itai
(c) Fluoride	—	Skeletal fluorosis
(d) Arsenic	—	Black-foot

5. A baby animal eats plant that grows on selenium rich soil. What will be the consequences in that animal on eating such plant?

- (a) It will show stunted growth.
(b) It will be having loss of appetite and gastro-intestinal disorders.
(c) It will be suffering from cirrhosis of liver.
(d) Both (a) and (b)

6. Select the correct pair.

(a) Joint Forest Management	—	1950
(b) Water (Prevention and Control of Pollution) Act	—	1980
(c) Environment Protection Act	—	1974
(d) Montreal Protocol	—	1987

7. Read the following statements and choose the correct ones.

- I. Secondary pollutants are formed by reactions amongst the primary pollutants in air.
II. Soot is the fine particulate matter passed out along with gases during burning of coal.
III. Dry deposition is settling down of wind blown acidic gases and particles over trees, various articles and soil.
IV. Natural source of water pollution includes run-off from agricultural fields.

(a) I and III	(b) I and IV
(c) I and II	(d) III and IV

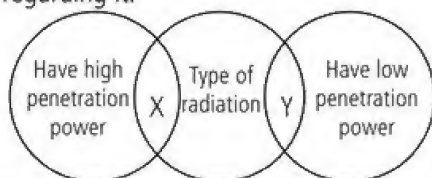
8. Which of the following statements about PAN is incorrect?

- (a) It damages chloroplasts, inhibits electron transport chain and spoils enzyme systems controlling cellular metabolism.
(b) It causes respiratory distress and eye irritation in human beings.
(c) It is an important primary air pollutant.
(d) It is a secondary pollutant.

9. Bharat stage IV is

- (a) implemented throughout the country since October 2011
(b) equivalent to Euro-III norms
(c) the norm of Mass Emission Standard
(d) implemented throughout the country since October 2010.

10. Refer to the given Venn diagram and select the correct option regarding it.



- (a) X is non-ionising radiation which includes ultraviolet rays.
 (b) Y is ionising radiation which includes X-rays, cosmic rays and atomic radiation.
 (c) X may cause formation of thymine-dimer in DNA whereas Y may cause sub-cutaneous bleeding in humans exposing to high dose.
 (d) X may cause genetic deformities which are inherited to progeny whereas Y is known to cause skin cancer.

11. Fill the blanks with suitable words.

Catalytic converters, having expensive metals like (i) and (ii) as the catalysts, are fitted into automobiles for reducing emission of (iii).

- | (i) | (ii) | (iii) |
|------------------------|-----------|--------------------|
| (a) platinum-copper | palladium | poisonous gases |
| (b) tungsten-gold | rhodium | sewage matter |
| (c) platinum-gold | palladium | particulate matter |
| (d) platinum-palladium | rhodium | poisonous gases |

12. Read the following statements and select the correct option.

- I. Classical smog is dark brown and opaque, formed by condensation of water vapours with H_2S and SO_2 over dust or smoke particles.
 II. Photochemical smog contains secondary pollutants or photochemical oxidants.
 III. Acid rain is the rainfall with a pH of less than 3 only.
 IV. Acid rain causes stone leprosy.
 (a) I and III are incorrect (b) I, II and IV are correct
 (c) II and IV are correct (d) II, and III are incorrect

13. Green muffler scheme involves growing green plants

- (a) along the road sides to reduce soil pollution
 (b) along the road sides to reduce noise pollution
 (c) in parks to reduce air pollution
 (d) in houses of a locality to beautify the environment.

14. Match column I with column II and select the correct option from the given codes. (There can be more than one match for items in column I).

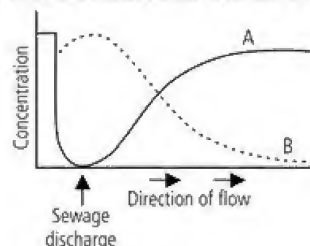
- | Column I | Column II |
|--------------------|-----------------------------------|
| A. Van Mahotsava | (i) K.M. Munshi |
| B. Chipko movement | (ii) Sunder Lal Bahuguna |
| C. JFM | (iii) September 1983 |
| D. Appiko movement | (iv) First week of February |
| | (v) Arabari Forest Range |
| | (vi) Panduranga Hegde |
| | (vii) Dasholi Gram Swarajya Sangh |
| | (viii) Ajit Kumar Banerjee |

- (a) A-(i, ii), B-(iii, v), C-(iv, vi), D-(vii, viii)
 (b) A-(i, iv), B-(ii, vii), C-(v, viii), D-(iii, vi)
 (c) A-(ii, v), B-(iii, iv), C-(i, vi), D-(vii, viii)
 (d) A-(iv, viii), B-(ii, v), C-(i, vi), D-(iii, vii)

15. Which of the following is the correct sequence of steps occurring during the primary treatment of sewage?

- (a) Settling tank → Screening → Primary sludge
 (b) Sequential filtration → Settling tank → Primary sludge
 (c) Sequential filtration → Settling tank → Activated sludge
 (d) Sedimentation → Screening → Primary sludge

16. Refer to the given graph. Identify A and B and select the correct option regarding them.



- (a) Sudden sewage discharge into a river will result in rise of B because decomposers consume a lot of CO_2 .
 (b) Fish and other clean water organisms do not need A to sustain their lives.
 (c) Sewage discharge into a river will result in rise of B because decomposers consume a lot of O_2 .
 (d) Fish and other clean water organisms reproduce faster if amount of B is high.

17. Read the following statements and select the incorrect option.

- (a) Negative soil pollution is reduction in soil productivity due to erosion and over-use.
 (b) Pesticides are generally broad spectrum and function as biocides.
 (c) Positive soil pollution is increase in soil productivity due to addition of undesirable substances.
 (d) Landscape pollution is converting fertile land into barren one by dumping wastes over it.

18. Incineration is the controlled aerobic combustion of wastes inside chambers at the temperature of

- (a) 900 – 1300 °C (b) 350 – 600 °C
 (c) 1500 – 1800 °C (d) 1100 – 1500 °C.

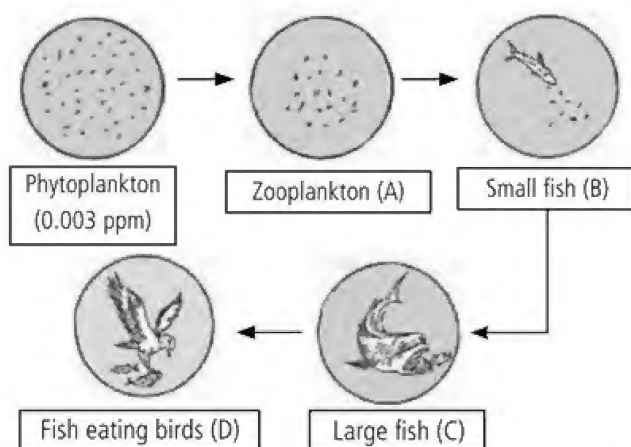
19. Read the following statements and select the correct option.

Statement 1 : A sudden high intensity of sound produces a startle reaction which may affect psychomotor performance.

Statement 2 : Noise pollution can cause increase in heart beat, defective night and colour vision, sleeplessness, etc.

- (a) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
 (b) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
 (c) Statement 1 is true and statement 2 is false.
 (d) Both statements 1 and 2 are false.

20. Refer to the given figure showing biological magnification of DDT in an aquatic food chain and select the correct option.



	A	B	C	D
(a)	0.04 ppm	2 ppm	0.5 ppm	25 ppm
(b)	0.006 ppm	2 ppb	4 ppm	8 ppb
(c)	0.04 ppm	0.5 ppm	2 ppb	16 ppb
(d)	0.04 ppm	0.5 ppm	2 ppm	25 ppm

21. Identify the mismatched pair.

- (a) ODS – Chlorofluorocarbons
 (b) Slash and burn agriculture – Deforestation
 (c) Methyl isocyanate – Bhopal gas tragedy
 (d) Ecosan toilet – Friends of Arcata

22. Read the following statements with reference to hot waste water produced by thermal power plants. Select the incorrect ones.

- (i) It causes reduction of dissolved oxygen content of water.
 (ii) It is used as natural fertilisers.
 (iii) It causes undesirable changes in algal population.
 (iv) It causes decrease in microbial activity in water.
 (a) (i) and (iii) only (b) (ii) and (iv) only
 (c) (iii) and (iv) only (d) (ii), (iii) only

23. Read the given statements and select the correct option.

- (i) Snow blindness occurs due to inflammation of cornea by UV-A radiations.
 (ii) As per National Forest Policy, hills should have a forest cover of 33% while in plains it should be 67%.
 (iii) The value of chemical oxygen demand is always higher than biological oxygen demand.
 (iv) Methane is the most abundant hydrocarbon in the atmosphere.
 (a) (i) and (ii) are correct.
 (b) (iii) and (iv) are correct.
 (c) (i), (ii) and (iv) are incorrect.
 (d) (ii) and (iii) are incorrect.

24. Read the following statements and select the correct option.

- (i) Global warming is likely to cause extinction of more than one million species of animals and plants by 2050.
 (ii) Secondary pollutants are absent in classical smog.
 (iii) Because of greenhouse flux, the mean annual temperature of earth is 25°C.

(iv) Delhi is the first city of the world to use CNG for its public transport system.

- (a) (i) and (iv) are correct. (b) (ii) and (iii) are correct.
 (c) (i), (ii) and (iii) are incorrect. (d) (i), (ii) and (iv) are correct.

25. X is a type of combustion inside chambers in the absence of oxygen at an elevated temperature of 1650°C. It does not yield pollutants but industrial gases and other useful substances are produced. X is

- (a) incineration (b) sludge burning
 (c) composting (d) pyrolysis.

26. Read the given statements and state which ones are true (T) and which ones are false (F).

- (i) The second R or rule of effective waste management relates to reuse the articles again.
 (ii) The second R relates to reduce generation of waste in all operations from mining to manufacture.
 (iii) The third R relates to collecting the waste and broken articles and disposing them of properly.
 (iv) The third R relates to recycling by collecting the waste and broken articles and manufacturing a new product.

	(i)	(ii)	(iii)	(iv)
(a)	T	F	T	F
(b)	T	F	F	T
(c)	F	T	F	T
(d)	T	T	T	F

27. Read the following statements and select the correct ones.

- (i) Ambient noise level in industrial zone should be 75 dB in day time and 70 dB during night.
 (ii) Ambient noise level in residential zone should be 65 dB and 50 dB in day and night time respectively.
 (iii) Ambient noise level in silence zone should be 45 dB and 30 dB in day and night time respectively.
 (iv) Ambient noise level in residential zone should be 55 dB and 45 dB in day and night time respectively.
 (v) Ambient noise level in commercial zone should be 60 dB and 50 dB in day and night time respectively.
 (a) (i) and (ii) only (b) (iii), (iv) and (v) only
 (c) (i) and (iv) only (d) (i) and (v) only

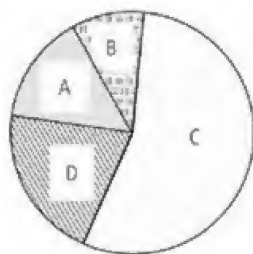
28. Identify A, B and C in the given table and select the correct option.

	Event	Year	Aim
(i)	IPCC	A	A world climatic programme was prepared.
(ii)	B	1997	Reduction in overall greenhouse gas emission was committed.
(iii)	C	2012	Reconciling the economic and environmental goals of the global community.

- (a) A – 1986, B – Kyoto Protocol, C – Beijing Protocol
 (b) A – 1988, B – Montreal Protocol, C – Rio + 20
 (c) A – 1986, B – Montreal Protocol, C – Beijing Protocol
 (d) A – 1988, B – Kyoto Protocol, C – Rio + 20

29. The rare parasitic and poisonous weed causing threatening to the genetic treasure of the Simlipal Reserve Forest is
 (a) *Parthenium* (b) *Eichhornia*
 (c) *Eupatorium* (d) *Lantana*.

30. The pie chart given below depicts the contribution of different gases to greenhouse effect. Identify A, B, C, D and select the correct statement regarding them.



- (a) C combines with haemoglobin thereby decreasing its oxygen carrying capacity leading to hypoxia in body tissue.
 (b) B increases the gaseous exchange in blood.
 (c) A is used in air conditioners and industrial refrigerators as coolants.
 (d) D is produced during the process of respiration and volcanic eruption.

31. In arctic regions, methane is coming out of earth's interior at many places called

- (a) methane hole (b) methane flux
 (c) methane chimneys (d) methane run off.

32. Select the incorrect option about ecosan toilets.

- (a) Dry composting toilets
 (b) No water is required
 (c) Excreta is converted into a natural fertiliser
 (d) Found mainly in many parts of Karnataka and Sri Lanka

33. Chlorofluorocarbon has the maximum ozone depleting potential or ODP due to release of

- (a) active chlorine (b) active bromine
 (c) active fluorine (d) hydrogen fluoride.

34. Testicular atrophy occurs due to harmful effect of

- (a) zinc (b) cobalt (c) lead (d) cadmium.

35. Primary sludge is not used for

- (a) biogas generation (b) composting
 (c) combustion (d) secondary treatment.

36. Which of the following statements is/are incorrect?

- (i) Deforestation leads to increase in atmospheric CO_2 content by releasing carbon stored in organic matter.
 (ii) There is decrease in amount of rainfall but increase in primary productivity due to deforestation.

- (iii) Forest cover has been removed by 30% in tropics and 10% in temperate areas.

- (iv) Desertification is a product of very less rainfall and soil erosion.

- (a) (i) and (iv) only (b) (iii) and (i) only
 (c) (ii) and (iii) only (d) (iii) only

37. Which of the following statements is incorrect?

- (a) Composting is the anaerobically or aerobically digestion of biodegradable organic matter of solid wastes.
 (b) Incineration involves anaerobically burning of non-biodegradable but combustible constituents of solid waste such as intravenous fluid bottles.
 (c) Indira Gandhi Canal has transformed the barren desert of Jaisalmer district into rich and lush fields.
 (d) Agroforestry is a cohesive approach to meet both food and non-food demands.

38. Read the following statements and select the option which correctly fills the blanks.

- (i) Polynuclear aromatic hydrocarbons are _____.
 (ii) Methane is produced naturally during _____ of organic matters.
 (iii) _____ causes chlorosis and necrosis of vegetation in as low concentration as 0.032 ppm.
 (iv) Soot is produced from _____ burning of carbohydrates.

- | (i) | (ii) | (iii) | (iv) |
|------------------|---------------|----------------------|------------|
| (a) non-toxic | decomposition | SO_2 | complete |
| (b) carcinogenic | accumulation | N_2O | incomplete |
| (c) non-toxic | accumulation | SO_2 | complete |
| (d) carcinogenic | decomposition | SO_2 | incomplete |

39. Hay fever occurs because of

- (a) dust allergy (b) fungal allergy
 (c) pollen allergy (d) chemical allergy.

40. Read the following statements and select the correct option.

- (a) Nitrate rich fruits and water produce nitrites in alimentary canal that enter blood and combines with haemoglobin forming met-haemoglobin.
 (b) Organic farming involves use of biofertilisers, pesticides of organic origin, susceptible and resistance varieties.
 (c) Excessive use of fertilisers causes soil deterioration through increase of natural microflora.
 (d) Weedicides, contain arsenic, sulphur and are persistent



Key is published in this issue. Search now! ☺

SELF CHECK



Check your score! If your score is

No. of questions attempted

No. of questions correct

Marks scored in percentage

> 90%

EXCELLENT WORK !

90-75%

GOOD WORK !

74-60%

SATISFACTORY !

< 60%

NOT SATISFACTORY!

You are well prepared to take the challenge of final exam.

You can score good in the final exam.

You need to score more next time.

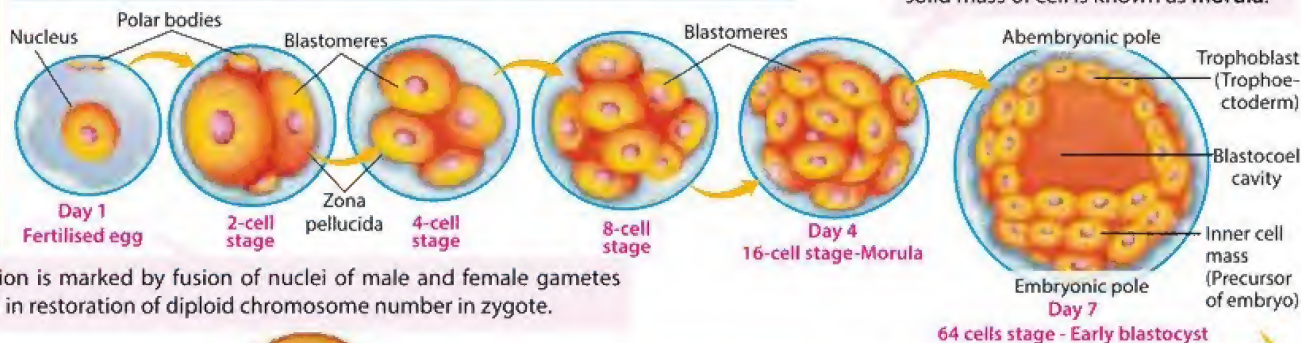
Revise thoroughly and strengthen your concepts.

Early Embryonic Development in Humans

Embryonic development in humans begins after conception and formation of zygote. The developing organism from conception until approximately the end of **eight weeks** (second month) is called **embryo**. Various stages of human embryonic development from zygote till the end of second month of pregnancy, have been given as follows:

Cleavage : Series of rapid mitotic divisions of the zygote convert single celled zygote into a multicellular structure called **blastocyst**.

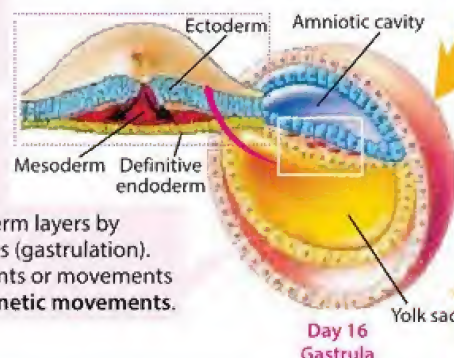
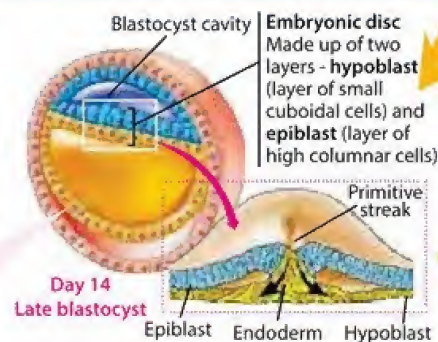
At the end of fourth day embryo reaches uterus. It has 8-16 blastomeres and this solid mass of cell is known as **morula**.



Fertilisation is marked by fusion of nuclei of male and female gametes resulting in restoration of diploid chromosome number in zygote.

Implantation : It is the attachment of blastocyst to the uterine wall which occurs after seven days of fertilisation.

Late blastocyst
It is the pre-embryo in which trophoblast develops into two layers (**syncytiotrophoblast** and **cytotrophoblast**) in the region of contact between the blastocyst and endometrium. It sinks into a pit formed in endometrium and gets completely buried in it.



Gastrula
Blastocyst is transformed into **gastrula** (Day 16) with three primary germ layers by rearrangement of cells (gastrulation). The cell rearrangements or movements are called **morphogenetic movements**.

Organogenesis : Following gastrulation umbilical cord starts developing and various organ system start differentiating.

